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A REAL SCHOOL SHOP for BOYS

BY FRED H. COLVIN
Editor, *American Machinist*

While thoughtful manufacturers and engineers have been more or less concerned over the lack of an adequate number of good mechanics, the war emphasized the need in unmistakable terms. It showed that we not only lacked toolmakers but also a supply of men sufficiently versed in the fundamentals of machine-shop work who could be well trained in a short time. Here is a school which is training boys to supply this need and paying them while they learn. It is a method and a school which is worth your serious consideration.

EVERYWHERE we go we hear the same story about the lack of good toolmakers, or of high-class mechanics upon whom you can depend to turn out accurate work in a reasonable time. Lack of tools and fixtures and the delay in getting them is holding up large enterprises today in more than one industrial city.

All sorts of reasons are given and the blame laid on everything from the administration to German propaganda, not omitting labor unions and general unreasonableness all along the line. But when all is said and done, the fact remains that we have not been training mechanics systematically for fifteen or twenty years; and as the farmer who complained of a poor crop when he had failed to plant his potatoes in the Spring would receive scant sympathy, so must we face the music squarely and see how to repair the error which is already of long standing.

We have been devoting all our time to mass production, taking green hands from the farm and the street-sweeper's gang and teaching them one operation. But we have quite overlooked the fact that we were using up our supply of toolmakers in making so-called fool-proof fixtures for the green hands to use. The demands of war brought this home to us very forcibly but comparatively few really woke up to the absolute need of consistent and persistent training in a systematic manner. The needs of industry do not seem to appeal as strongly as they should unless directly coupled with immediate profits, in spite of the fact that large profits have been made. It is also possible that some expenditure for real education might reduce the taxable profits more legitimately than some other methods and at the same time confer a direct advantage on the country as a whole as well as on industry in particular.

In spite of the fact that he is one of the largest trainers and users of semi-skilled operators, Henry Ford has inaugurated a plan in connection with his home plant in Detroit, Mich. This comprises a real shop school, an entirely separate institution, housed in a separate building and independent of the Ford Motor Co. The headpiece and Figs. 1 and 2 give an idea of the way in which it is handled.

It takes boys from 12 to 15 years of age and keeps them until they are 18 years old. The boys are picked from those who, on account of family finances, would have to leave school at an early age. As might be expected, most of the boys have lost a father or mother, or in some cases both. The only requirements are that the boy shall really want to learn, shall be fairly industrious and be capable of promotion. One boy is a Filipino, who ran away from home because his father would not let him go to school. He found his chance in Detroit, 8,000 miles away, and is making good. Among the nations represented are China, Italy, Mexico,

Russia and many others. And they are all laying the foundation for good mechanical training.

From the beginning the boy gets both classroom and shop work and furthermore, he gets 19 cents an hour, or $9.12 for a 48-hr. week. He also gets paid for holidays, a three-weeks' vacation in the summer and a special payment of two dollars per month to go into a personal saving fund. The only string on this is that he cannot draw the money out without the approval of the director; the idea being to start him into the habit of having a savings account without taking it out of the earnings which aid in the family support in nearly every case. The classroom gives the younger boy practically the same studies he would receive in public school up to the eighth grade. After that stress is laid on mechanical subjects such as drawing, mathematics, physics or mechanics, a little metallurgy and chemistry such as mechanics and good toolmakers should know. Laboratories are being fitted for this work.

All of this time, however, the boy is getting practical experience in real shop work. There are no "exercises" which are to be machined and scrapped, but every job has a commercial use. In the beginning, small parts of Ford cars are worked on to give experience in drilling, turning and the like. If the parts pass inspection, and it is the same rigid inspection which accepts or rejects parts of the regular product, they are purchased by the Ford Motor Car Co. at the same price it costs to make them in their own shop.

Toolmaking Work

When the boy gets experience in the use of several machines in the production department he graduates into the advanced or tool department. Here he gets away from the production work and begins to make direct progress in tool making, beginning of course on simple work, but all are genuine pieces which are needed in the great Ford plant. The tool-making rooms of the Ford Motor Co. afford a constant supply of material for the boys to work on. Parts of jigs, fixtures, and tools of various kinds are always available and are so selected by the instructors as to afford the kind of experience needed. For this is a school in every sense, production being a side issue and only adding interest in letting the boy know that he has done something worth while.

Some idea of the equipment may be had from the fact that there are about eighty special Reed-Prentice geared-head engine lathes each driven from a motor in the base under the head. Future equipment will include lathes of other makes so as to give advanced students experience on a variety of types. There are also milling and other machines found in all the toolrooms. One of the objects of this school is to give such fundamental training that the boys will be able to become good toolmakers with a few years' experience in the toolroom after they leave the school at 18 years of age. Some will go into the regular apprentice course which gives them experience in all the different departments. These will form a body from which shop foremen and other executives can be chosen, so that there promises to be a supply of practically trained young men for this company as the years go by. And the inducements offered are usually sufficient to hold those who are most valuable.

FIG. 1. IN THE SCHOOL ROOM

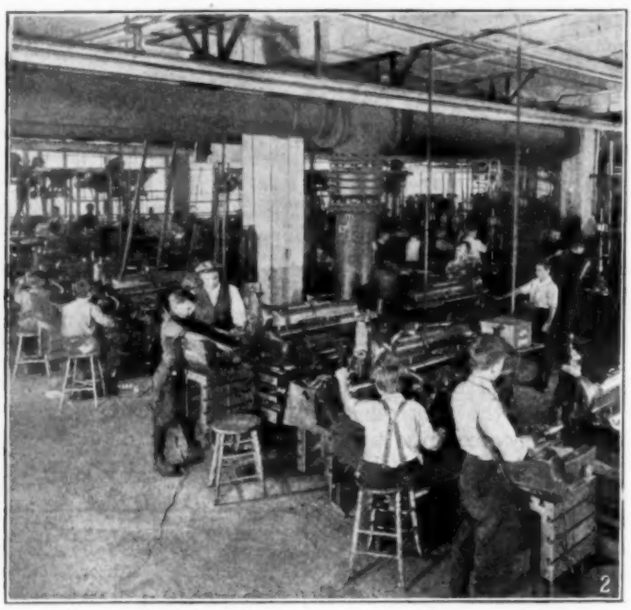


FIG. 2. IN THE SHOP

The Line of Advancement

Getting back to the boy who, as he enters the school, starts at 19 cents an hour. He receives monthly marks in classroom and shop industry. The industry involves *conduct* and *effort* and only these two things. *A* is excellent, *B* is good, *C* is fair and *D* is poor. If a boy receives a mark of *good* in both shop and class his rate for the next month is one cent more, if *fair* the rate is unchanged, if *poor* it is reduced one cent, but never below 19 cents. The maximum is now 27 cents.

Actual production or skill in either shop or class does not affect the rate. It is figured that if a boy tries, production will be a byproduct. The results show that a large number of boys respond to the treatment.

By the time this article is printed each boy will be receiving a hot lunch for which there will be no charge. This idea of paying boys while learning the trade was always a pet plan of our lamented Prof. John E. Sweet,

and it would have pleased him greatly to see it worked out as in this case.

Another interesting feature in connection with the school is the fact that a number of the boys come from the Juvenile court, where it is recognized that many young delinquents are unfitted, temperamentally or otherwise, for continuous study. The combination of study and work, especially the kind of work which shows them the real usefulness of their studies, offers a safe and constructive outlet for their pent-up energies. This has been brought out a number of times in various places, notably in the Milwaukee Trade School, which had cases where boys who were almost incorrigible in school were apt students where real work was concerned.

It is also a question as to whether any boy or girl will not study better and understand the problems better if they can work them out in actual practice to see how they apply. Mathematics, which seem dry and unnecessary, take on a new interest when they see, in solid metal or otherwise, just what the calculations are for and how they work out.

All this has no connection with the educational work done to teach English to the foreign-born, or other advanced work which will be treated in a later article. It is simply an earnest attempt, now about three-years old and embracing 330 boys at the present time, to aid in increasing the supply of good mechanics which we so sadly need.

Looking Backward

BY HARRY B. STILLMAN

Not long ago I overheard two gray-haired mechanics discussing regretfully the passing of the good old days of twenty-five or thirty years ago.

I remember well the period to which they refer. I also recall a number of unpleasant features of those earlier days that I am mightly thankful do not exist in the well-managed factory of modern times. In fact I believe that it wouldn't be far out of the way to state that the majority of shop men who have been "through the mill" have little inclination or desire to drop back to the conditions of a quarter century ago.

Many changes have taken place in shop management since that time; none more remarkable than the improvements in working conditions and in the interest shown by the employer in the well-being of his help. Human interest in and concern for the employee's welfare is rapidly taking the place of the indifference and unconcern of the past. To prove my statements one has but to observe how at the present time if a man is found unsuited to his job, or his job is found unsuited to him, he is given a chance to "try out" on other work.

By a little manouvering it is often found that John Smith, who is a poor grinder, turns out to be a good lathe-hand; a man with the necessary patience and a natural aptitude for close assembling is frequently discovered in the chap who is just "getting by" at kicking a blanking press, etc.

In the so-called "good old days" there was very little attention paid to square pegs in round holes. If, for example, Bill Jones, who tips the scales at 127 lb., was hired to wheel heavy castings, and after a few days' trial grumbled because of the physical exertion required, he was very careful that his mutterings did not reach the foreman's ear. The boss, as Bill was well aware, had no scruples in telling a man what he could do if he didn't like his job, and usually it was the very thing a man did not choose to do. A job in those days didn't grow on every bush, so Bill wisely refrained from pressing the matter and continued to wheel castings.

Nowadays there is hardly a plant of any size that doesn't keep a watchful eye on the general health of its employees. During the fall and early last winter fully 15 per cent of the help where I am employed were suffering with boils. It was a trouble for which the company was in no way to blame, yet every boil victim in the factory was given proper medical attention gratuitously, if circumstances permitted—(naturally, there *are* moments when one thus afflicted wishes to be alone). It was then that I had good reasons to be thankful for the present-day policy of allowing an employee to change his work occasionally, because at that time I found it much more convenient to stand at my work than to sit down.

Particularly would I call the attention of the past-loving advocates to the up-to-date facilities of the modernly equipped factory for the prompt and efficient treatment for wounds and injuries. Let us say an employee cuts his finger. He reports immediately to the factory hospital, or else is taken in charge by a white-clad nurse, who with experienced hands bathes the wounded member and deftly wraps it in antiseptic gauze. In a case of this kind twenty-five years ago the wounded finger would have been dressed with moist chew of tobacco, held in place by a strip torn from the first rag that came to hand; a rag which had probably been used for a number of odd things before being utilized as a bandage. The finger would generally heal—in time—but at what risk?

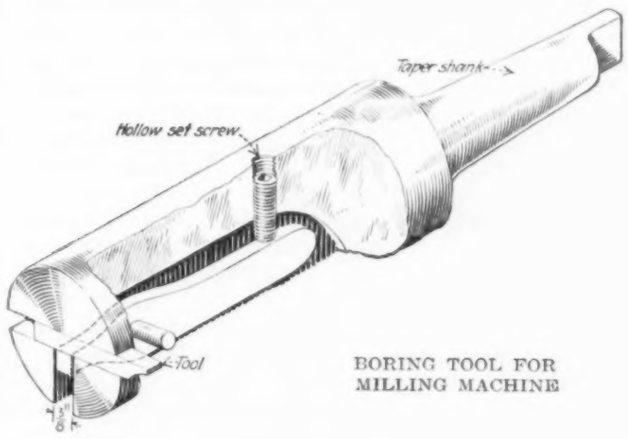
There may be a few champions of the olden days who will chuckle to themselves and say that the partly-chewed tobacco "cure" was quite as effective as the antiseptic wash and sanitary wrapping; but thanks to the instructive teaching we have received on the subject most of us would hesitate before accepting such treatment.

Boring Tool for Milling Machine

BY RICHARD H. KIDDLE

While the tool shown in the illustration is not new, it is a simple and easily made device which I have found to be very useful and I am passing it on with the hope that it may be of service to others.

The sketch renders its construction sufficiently obvious to need no description.



BORING TOOL FOR MILLING MACHINE

How Do You Regulate Materials?—I

By HENRY H. FARQUHAR

The most pressing problem of the country, as a whole, is that of securing maximum attainable production. If the attention and co-operation of manufacturers and of labor may be turned wholeheartedly toward maximum economical output, the questions of hours and wages, representation, and division of profits will largely take care of themselves.

IN ORDER to secure maximum production, balanced attention must be paid to the factors underlying good management. Of these factors, few are more important or more susceptible of strict control than materials. It is some of the fundamental considerations in securing adequate material regulation which I wish to review. In this I am not talking particularly to the large manufacturer, but primarily to the owner of the average-sized plant. Neither am I dealing with details and mechanisms, but with certain universal principles of management upon which alone permanent success can rest. These basic principles may then be formulated into a number of simple rules for every-day use under the varying conditions encountered in practice. It is with no apology for "generalities," therefore, that I wish to stick absolutely to basic considerations. Once their significance is grasped, proper detailed methods will follow with a little thought and care.

Without question, adequate material control lies at the foundation of efficiency in production. We may have the very latest machines and ever so fine a toolroom; we may go to great detail in attempting to schedule each job to best advantage, or we may initiate an elaborate bonus system, and so on; yet, unless the right material in the right quantity and at a proper cost be forthcoming exactly when needed, all such measures cannot avail in the fight for high production and low costs.

In developing modern methods of manufacture in a run-down plant we may begin with inspection or with an incentive method of pay, or we may attempt to start a planning department. If we do so, however, without first getting a firm grip on materials, we are but taking steps which must usually be retraced. A manager said to me recently: "I wasted hundreds of dollars, after buying high-speed tools, in letting a man who said he knew the game take time studies which finally had to be ditched because taken before sufficient preliminary preparation. I finally had to go back and standardize machines so they could stand the heavier work with high-speed tools; then I had to go further back and get control of my material, and now I am just beginning to get results from time study which I can rely upon." The materials factor is simply fundamental; no matter where we start we are sooner or later forced back to it; it is to succeeding operations as the foundation is to the building.

In analyzing the factors which underlie adequate material regulation in the factory, it will be helpful to consider them under the broad natural subdivisions into which practical material handling naturally divides itself. We have, first, the group of problems centering around the *replenishment* of materials of all kinds: considerations entering into the determination and regulation of what materials we are going to use, in what quantities we need them, upon whom are to rest the responsibilities for maintaining a proper supply, and how these responsibilities are to be made definite and effective in practice. Second, there are the problems of the *receipt and storage* of materials: how and by whom materials are to be accounted for in quantity and quality, upon their arrival at the plant; where and how, and in whose charge, they are to be stored pending their subsequent issue, and how proper accounting for them is to be obtained. Finally, we have the questions relating to release of materials from storage, or their *issue* for use and the problems of *organization* for material control.

1. The Replenishment of Materials

Materials, in the sense in which we use the term, exist solely for the benefit of production. In the ordinary plant, only by processing materials to the finished state may they be sold at a profit. Except in a strongly rising market, or with a seasonal product, such as coal for instance, the interest on money tied up, storage space costs, depreciation, and often obsolescence charges on materials in excess of current needs, may ordinarily be expected to more than offset any advantage gained from buying in excess of actual requirements for a reasonable future period. Aside from these factors, buying largely ahead of use has other disorganizing and psychological effects which cannot be so easily gaged. On the other hand, the lack of ten cents worth of just the item we need when we need it may produce disastrous consequences.

For all practical purposes, then, in the overwhelming majority of cases, we may state that the first and most important rule of effective material control to be:

I. Replenishment of Materials Must Be Governed Strictly By Requirements for Production During a Reasonable Future Period

This implies that we shall have an accurate up-to-date record or balance sheet for each item of material we carry. The balance sheets may be said to form the pivot about which the whole mechanism of material control revolves. Out of experience the following list of factors for such a balance sheet has grown:

The balance sheet should embody:

1. Materials outstanding on purchase orders.
2. Materials now on hand in the storeroom.
3. Materials assigned or reserved to manufacturing orders now in our hands, but not yet in process.
4. Materials available for reservation to future manufacturing orders.
5. A cumulative and accurate measurement of successive requirements against amounts still available.
6. A predetermined but flexible minimum or low limit (determined by considering rate of use and time needed to renew plus necessary allowance for safety) below which the amount on hand or the amount available shall not fall before a replenishment order is issued.
7. A predetermined but flexible standard amount to

order when this low limit is reached. This figure is based on:

(a) Rate of use in the past.
(b) Probable future rate of use.
(c) Percentage to allow for unforeseen delays.
(d) Time necessary to secure material at factory door after issuing replenishment order.
(e) How often it is desirable to issue orders for it.
(f) The present price.
(g) The probable future price curve.
(h) The space available for storage.
(i) The money available or expedient for the investment.
(j) The probable depreciation or obsolescence of the item.

By accepting this first "point" I do not mean that you must become hidebound in adherence to it. As intimated previously, in applying it in practice opportunity must be left for the exercise of common business judgment within certain limits. Obviously, when the purchasing agent sees a chance to better the purchase price by increasing the amount contracted for he must be free to speak right up in meeting to this effect; when traffic conditions become involved the traffic manager must notify everyone concerned so that we may not fall down in practice through reliance on the general principle which governs renewals partly by the time to renew. Responsibility must be placed also, so that an upset may not occur through an unexpected increase in the rate of consumption, through a discontinuance of the use of a particular material, nor through trouble with the source of supply. Similar contingencies may and do arise in any undertaking; the important point in this connection is that in most cases they may be adequately provided for through proper checks and balances so that we need not thereby doubt the wisdom of accepting this general principle as the North Star of adequate material control.

In partial explanation, and also in preparation for some of the things which will follow, it should be recalled that there are two quite distinct kinds of purchasing. Some articles are practically standard quality throughout the country no matter who makes them; the price is practically uniform everywhere at any given time no matter from whom they are bought, and but slight variations occur in price from time to time.

In the case of some other articles there is more variety offered, but once our choice is determined upon, little further judgment in purchasing is required. In this class fall most of the miscellaneous factory supplies and many of the raw materials used in making the product, and purchases of such material ordinarily form (with respect to routine work involved) the major part of the work of purchasing. Replenishment, in such cases, can be almost automatically governed strictly by current needs, as expressed through the balance sheet, and purchasing may be satisfactorily conducted by anyone with a systematic turn of mind. Such purchasing will hereafter be described by the term "routine."

The other kind of purchasing is of a different nature, partaking more of the nature of a speculative business, and it will be referred to as "speculative purchasing." Here we need a man of large calibre—one who can watch and gage market tendencies, and balance these tendencies against immediate and probable future production requirements as indicated in sales tendencies, against the condition of the exchequer, and against storage facilities, and who in general can interpret business tendencies. Indeed, the questions arising in the conduct of purchasing in such cases may involve questions of policy of the whole establishment, thus throwing decision on the general manager or on one of the higher officials; after a decision is reached, however, the order may be executed through the purchasing department in the regular way.

Although a man responsible for decisions in this type of purchasing must be left a good deal of discretion, it is nevertheless imperative that he automatically have just as accurate information as his more strictly regulated brother. By this I mean that the items which are delegated to his care must be regulated by the balance sheets described just as carefully as must the routine items, that low limits and amounts to order must be just as carefully set, that the balance clerk must keep the same records and send the same replenishment orders to him as are sent to the routine purchasing agent, and that in general a uniform procedure throughout for all materials—both routine and speculative—be insisted upon.

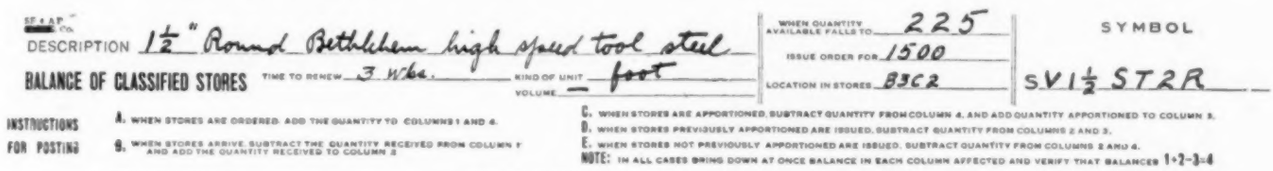

DESCRIPTION 1½" Round Bethlehem high speed tool steel
BALANCE OF CLASSIFIED STORES
TIME TO RENEW 3 Wks.
KIND OF UNIT foot
VOLUME —
WHEN QUANTITY AVAILABLE FALLS TO 225
ISSUE ORDER FOR 1500
LOCATION IN STORES B3C2
SYMBOL
SV1½ ST2R
INSTRUCTIONS FOR POSTING
A. WHEN STORES ARE ORDERED, ADD THE QUANTITY TO COLUMNS 1 AND 4.
B. WHEN STORES ARRIVE, SUBTRACT THE QUANTITY RECEIVED FROM COLUMN 1 AND ADD THE QUANTITY RECEIVED TO COLUMN 2.
C. WHEN STORES ARE APPORTIONED, SUBTRACT QUANTITY FROM COLUMN 4, AND ADD QUANTITY APPORTIONED TO COLUMN 3.
D. WHEN STORES PREVIOUSLY APPORTIONED ARE ISSUED, SUBTRACT QUANTITY FROM COLUMNS 2 AND 3.
E. WHEN STORES NOT PREVIOUSLY APPORTIONED ARE ISSUED, SUBTRACT QUANTITY FROM COLUMNS 2 AND 4.
NOTE: IN ALL CASES BRING DOWN AT ONCE BALANCE IN EACH COLUMN AFFECTED AND VERIFY THAT BALANCES 1+2-3=4
1—STORES ORDERED BUT NOT YET RECEIVED
2—STORES ON HAND IN STORE ROOM
3—STORES APPORTIONED TO ORDERS BUT NOT YET ISSUED
4—STORES AVAILABLE FOR APPORTIONMENT

FIG. 1. HEADING FOR A SATISFACTORY BALANCE SHEET

The top of a satisfactory form of balance sheet, showing directions for posting, is illustrated in Fig. 1. In this case the estimated consumption was 60 ft. per week; therefore, during the time it takes to replenish the supply (three weeks) we should ordinarily use 180 ft. Adding 25 per cent to this for safety, we get a "low limit" of 225 ft. below which the amount on hand shall not be allowed to fall without issuing a replenishment order. If, other factors as explained in the text being considered, we desire when ordering to purchase a 25 weeks' supply, we get 1,500 as the amount to order.

After the replenishment order with its indication of the standard amount to order, as per manufacturing requirements, is received, however, the speculative purchasing agent is not necessarily bound to follow this advice. When he departs from the beaten path, however, the burden of proof should be distinctly upon him.

As has been indicated, the replenishment order is the means by which the machinery is set in motion for

FIG. 2. THIS OVERFLOW STOREROOM IS UNNECESSARY WHEN MATERIAL REPLENISHMENT IS PROPERLY REGULATED

supplying ourselves with goods. Certain safeguards, therefore, must be thrown about the procedure of ordering in that multiplication of individual opinion and preference may not replace demonstrated needs and adaptability as a basis for purchase. From such considerations spring the three following simple and obvious rules dealing with this phase of material handling.

II. There Must Be Predetermined Specifications for Each Article Purchased

It is easy to go too far with detailed, written specifications. Judgment is necessary in drawing the line. Responsibility for quality should be centered in the engineering or other technical department; every item and every use should be systematically scrutinized, and, after consultation with various interested persons, useless varieties and frills discarded.

This applies to miscellaneous supplies such as stationery, pencils, ink, etc., as well as to raw materials. Although in the former case the standardization may often stop with the simple designation of a few standard kinds which are to be thenceforth stocked, even in this case a surprising simplification will result all down the line, including the storeroom and the balance sheets. A case recently occurred where, through such a process as has been described, the varieties in certain classes of stores were reduced by over one-third.

III. All Replenishment Orders Shall Be In Writing and May Be Issued Only By Specified Persons

This simply means that we must not allow anyone, from office boy up, to ask the purchasing agent to buy whatever he considers he needs. If we do, we are by so much lessening our control of a most important phase of the work, and of course we need not hope to adhere to such standard articles as have been designated.

Probably nine-tenths of all replenishment orders in the well-organized factory will be made from the balance sheets described previously, and in fact the responsibility for writing and following all replenishment orders may be centralized in the balance clerks. In the case of special items not ordinarily carried in stock, however, opportunity may be left to department heads to order direct what they need.

An invariable rule should be made that no verbal orders will be accepted unless confirmed immediately in writing.

IV. All Replenishment Orders Shall Be Approved Before They May Be Honored By the Purchasing Agent

Responsibility for seeing that predetermined standards are adhered to when ordering materials should be centered in some one official, whose O. K. is necessary before the purchase order may be issued. Just who this official should be depends somewhat on local circumstances, but he should be in a position not only to check up on variations from standard and on needless orders, but also to catch an order for an amount of material inconsistent with probable future manufacturing needs and to substitute different materials where this seems desirable or necessary. He must, in other words, be in close touch with production, and responsibility for revision of low limits and amounts to order should be vested in him.

Through the enforcement of Rules II., III. and IV. many annoying irregularities in requisitioning supplies may be stopped at their source; it is by means of such simple regulations that authority may be definitely centered and routine systematically controlled. After the standard articles are requested and approved, however, there is one last step in the control of replenishment which is necessary in order to guard against division or avoidance of responsibility with changes in conditions brought on through shifting personnel or procedure:

V. All Purchase Orders Shall Be In Writing and Must Be Systematically Followed Up

"I ordered those screws three weeks ago; delivery was promised in one week, and they should have been here long before this." No such alibi should be accepted, for it is the purchasing agent's duty to see that purchase orders are not issued and then forgotten, either by himself or by the dealer from whom he buys. In initiating a nearly automatic system for governing the ordering of stores, part of the data which must be collected is the time necessary to secure material at the factory door after issuing replenishment order. This time, be it three days or three months, must be specified in writing for each article by the purchasing agent, consulting with the traffic manager if necessary. Using this time as one factor, the amount to order is determined, and thereafter no excuse should be accepted for the goods not arriving in the time set.

If for any reason the time set must be changed, this fact must be reported at once to whomever is responsible for the revison of low limits and order points (see preceding topic) so that they may be correspondingly modified. Since responsibility for time needed to renew is placed squarely upon the purchasing department, this department must of course take measures to see that all outstanding purchase orders be systematically followed. The tickler is of course the way to do this, and for this purpose a carbon copy of the purchase order, which must always be in writing, may be used.

These five simple rules express the principles by which supply of material may be adequately controlled. If we embody and enforce them in material routine, we may feel reasonably secure in the belief that we have adequately provided for the regulation of one of the most important phases of material handling—replenishment.

Care of Cast-Iron Straightedges

By E. A. DIXIE

Some years ago Professor Sweet wrote a series of articles for the "American Machinist," entitled "Things that Are Usually Wrong." Looking back at that series I wonder why he omitted a criticism of the cast-iron straightedge which is in such common use in machine shops and toolrooms.

I HAVE a straightedge which is, or *was*, straight until I loaned it to a toolmaker who thought, as I did at the time, that he knew how to take care of it. But perhaps I better tell you the whole story:

I have no desire to go into the methods of making these tools. Either by originating by making three straightedges or scraping to a true surface plate, any good scraper hand can produce a true straightedge. I have no quarrel with the methods employed to make them, what I am peeved at is the design. The one I refer to is the straightedge which is usually accepted as the correct one—the trussed arch, the one with a straight front and a humped back.

Theoretically, such a straightedge may be everything that is desirable, but in practice it is all wrong, for unless one has a true surface plate, or two more straightedges or one straightedge and a surface plate to check it with, one can never know whether it is straight or not.

As all straightedges warp, they should, if possible, be self-checking, and the only form I know which will afford this valuable feature is that shown in Fig. 1. In this type of straightedge the two opposite edges are scraped not only flat but parallel to each other. If the edges of such a straightedge become warped the error can be readily detected on any *fairly* flat surface, for instance a flat machine table or, in fact, any planed piece of metal as long as and a little wider than the straightedge itself.

After such a tool is made *straight* care should be exercised to keep it *straight*, for more straightedges are crooked by lack of care when the tool is not in use than from carelessness while in use. When not in use this type of straightedge should be *hung* up as shown in Fig. 2. If it is being used so constantly that it is not convenient to hang it up after each time it is applied to the work then it should be laid down, not on either of the finished edges, but *on its side*. If allowed to stand for any length of time with one of its finished edges in contact with an uneven surface it will take a set and require rescraping. If laid on its side even on an irregular surface so that it takes a set, the set will be sidewise and will not to any great extent impair the accuracy of the planes of the edges.

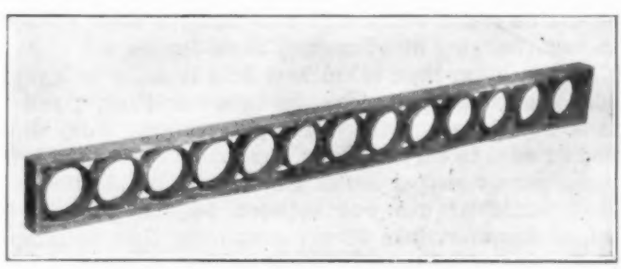


FIG. 1. CAST-IRON STRAIGHTEDGE WITH PARALLEL EDGES

It was just such a straightedge that I loaned to the toolmaker, as stated in the first paragraph of this article. When I loaned it I asked him to be careful with it and he assured me he would. When he brought it back the following morning I tested it as shown in Fig. 3.

In Figs. 3, 4 and 5 similar reference letters are used for similar parts, *A* is the straightedge; *B* the surface plate; *C* and *C*' points where pressure is applied and *P* and *P*' the pivotal points under various conditions. The condition shown in Fig. 3 indicates that the edge of *A* next the surface plate is straight. The straightedge is placed as shown by the full lines. Sidewise pressure, in the direction of the arrow, is applied by the finger at *C*. If the straightedge is straight it will turn about the pivotal point *P*. If sidewise pressure is applied at C' the straightedge will turn about the pivotal point *P*'. The straightedge is now turned over and the other edge tested in the same manner, of course with parallel edges if one edge shows straight the other edge must be straight. The condition shown in Fig. 4 shows that the edge next the surface plate is convex and that the pivotal point *P* is about the center of the length of the straight-edge. Of course, in practice the straightedge may warp so that the high or pivotal point on the convex side may be almost anywhere on the surface. When one edge shows the condition just described the straightedge is turned over and if it has been scraped truly parallel we will then, on the other side, find the condition shown in Fig. 5. Here if the pressure is applied at *C* in the direction of the arrow the straightedge will pivot at *P*' and if applied at C' will pivot at *P*.

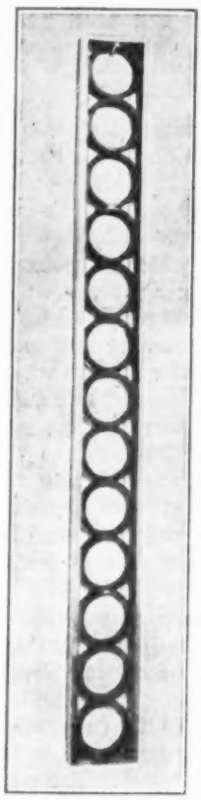


FIG. 2. STRAIGHT-EDGE HUNG UP TO MINIMIZE WARPING

When I discovered that the straightedge was as shown in Figs. 4 and 5, I asked the toolmaker why he had not been as careful with it as he had assured me he would be. To this he replied that he had been very careful, that when he had finished with it the night before he had placed two pads of cotton waste at the back of his bench and had laid it gently down with one edge resting on the cotton pads. As a matter of fact it would have been better resting direct on the bench for it had sagged all night between the two supporting pads of cotton waste and had by that time taken a set of over a thousandth of an inch.

Obviously, tests such as shown in Figs. 3, 4 and 5 would be impossible with the truss-beam type of

straightedge for the reason that it has but one straight edge. We have a number of these in the works and while they may have been straight originally all of them are now more or less out of true. One in particular I am told was considerably over a hundredth of an inch out before it was last trued up.

And the peculiar thing about this is that the greater part of this variation from truth is caused not by wear in use but by improper care when the straightedge is not in use. From observations I have made I am thoroughly convinced that carelessness in storing straightedges is responsible for their warping or at least nine-tenths of it and that the other tenth may be attributed to seasoning.

It is not always convenient to hang up straightedges of the truss-beam type but they can usually be stood on end or they can be laid on their sides when not in use. And either of these positions will to a great extent preclude warping.

The Design of Straightedges

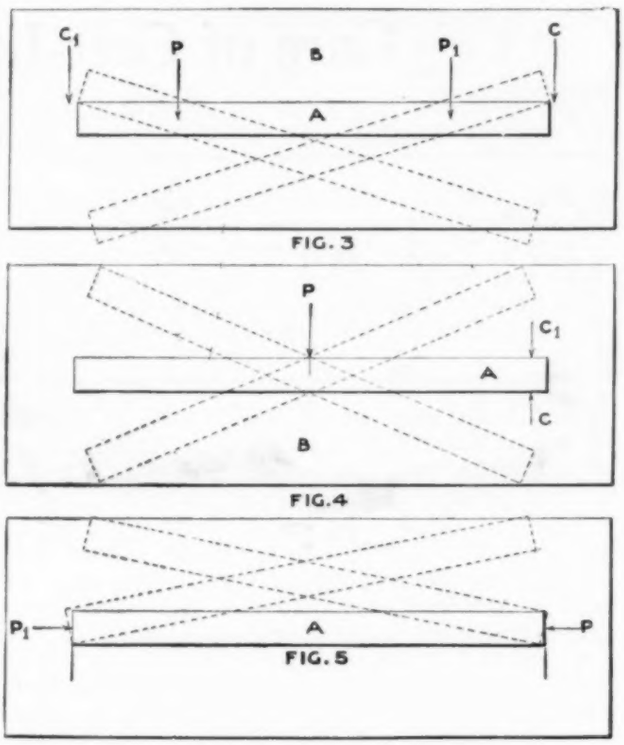
Regarding the designing of straightedges the rules to follow are few and simple. The edges and webs should be nearly the same thickness. This will result in better castings because the castings will cool and shrink uniformly, thus obviating defects due to unequal shrinkage such as shrinkage cracks and "draws" which are so common where a heavy member adjoins a light one. The molding should be carefully done to avoid sand and blowholes, the latter usually caused by ramming the mold too hard. Broadly, it may be stated that a pattern which produces a good sound casting free of "draws" will make a good straightedge, providing it is otherwise clean and well proportioned. The reason for this is that the stresses to which the casting is subjected during the cooling period are practically identical with those to which it is subjected during the seasoning period of its life. The only difference being in the *rate* at which the molecular changes take place.

The casting should be planed as soon as possible to see whether it is sound enough to make a perfectly clean straightedge. Before finish-planing, the casting should be subjected to some sort of seasoning. It can be left around the shop for a period of time to allow the casting and planing stresses to equalize. Or it can be subjected to one of the accelerated seasoning processes. The most commonly practiced form of rapid seasoning is as follows:

The casting is alternately heated and cooled for a greater or less period of time, depending on the size of the work and the amount of seasoning the individual seasoner guesses it ought to have. If there is a convenient core oven the casting can be placed in it over night and then put out in the yard during the day to cool off and again put in the core oven the following night. Personally I do not believe that the cooling period is of any assistance. The molecular change takes place much more rapidly under the influence of heat, the heated period therefore does the bulk of the work, the cooling period merely retards the molecular change.

Vibration Helps Seasoning

If the would-be seasoner can find some place in the factory where there is a lot of violent vibration, such as one often finds in shops where there are polisher's benches, he will find that castings season very rapidly



FIGS. 3 TO 5. TESTING A STRAIGHTEDGE WITH PARALLEL EDGES

Fig. 3—Edge next to surface plate straight. Fig. 4—Edge next to surface plate convex. Fig. 5—Edge next to surface plate concave.

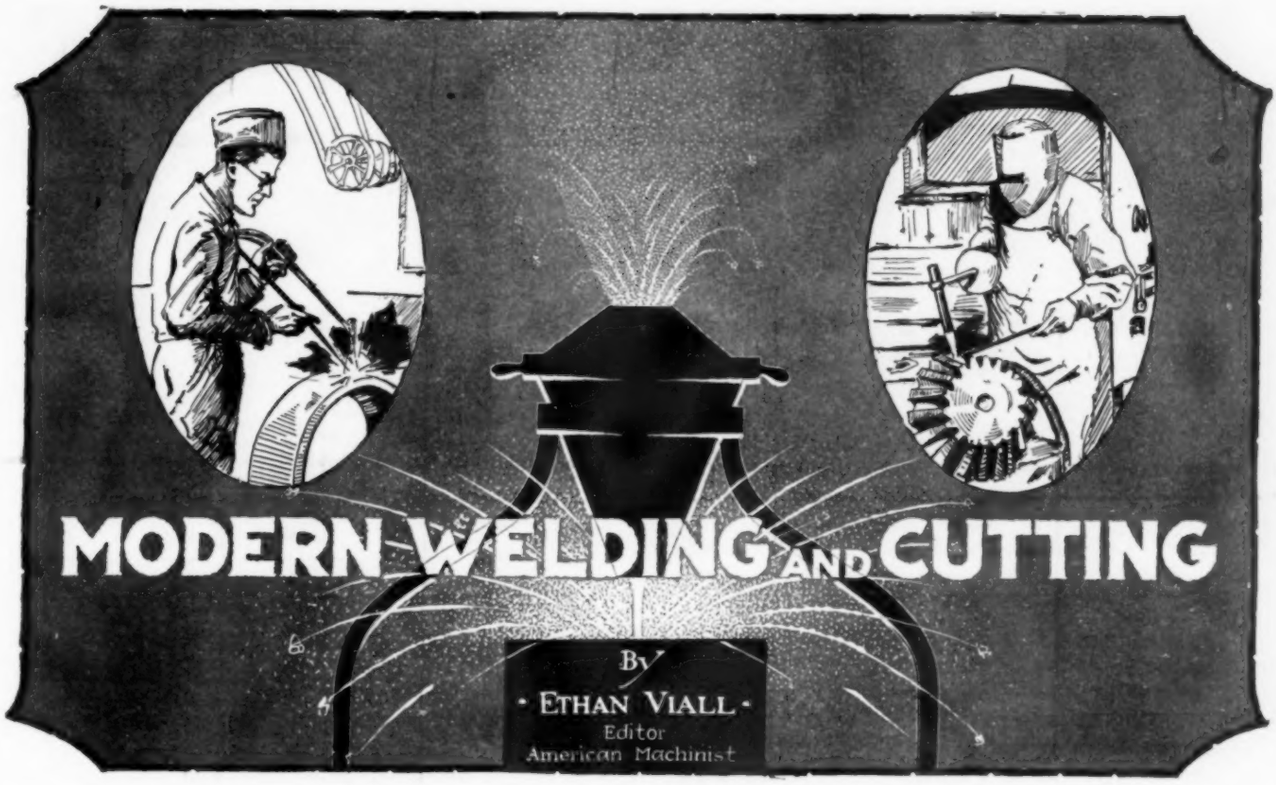
when subjected to vibration. A couple of weeks on a polisher's bench, especially if his wheels are running out of true, will have as much effect on the castings as six months or a year just lying around the shop. If it is decided to season by leaving the casting around the shop care should be taken to protect it against being dented by coming in contact with other castings or hard material. For every time a dent is made in the castings new stresses are set up which will take time to relieve.

Finish planing should be very carefully done. The tools should be as keen as possible, for even under ideal conditions with the sharpest of tools, the surface is somewhat compressed, that is to say peened, which of course means more stresses to be relieved.

After finish planing a night in the core oven or an hour on the polisher's bench will serve to release practically all the stresses introduced during the planing operation.

Scraping should be carried on on both sides alternately. I mean by that that there would be poor results if one side were scraped to a finish before the other side was scraped. If time is no object the edges should be rough scraped all over and the work allowed to rest (hanging up of course) for a few days.

I have often been asked how long it takes to scrape such a straightedge. The one shown in Figs. 1 and 2 is 38½ in. long and the working faces are 1⅜ in. wide and 3¾ edge to edge. It was scraped by one of the best and quickest scraper hands I ever saw and his time on that particular one was between 14 and 15 hr. It might, however, take 50 per cent more time to scrape a similar straightedge. When finished the one shown was not more than 0.0002 in. out of straight or parallelism *on the bearing spots.*



THE gas-torch cutting process consists of heating a spot of the metal to be cut to a good red heat and projecting on it a jet of oxygen. This causes the metal to burn away, a stream of slag running out of the kerf thus produced. Cutting is not melting, in the ordinary sense, although since the heating flame is the only visible agent, such might be the beginner's conclusion. It should be remembered that the heating flame is only used to make the metal hot enough to oxidize easily.

Metals whose oxides have a lower melting point than the metal itself can be cut by the gas torch. Such metals are wrought iron and steel. Where the oxide has a higher melting point than the metal, cutting cannot be done with the gas torch. Such metals are copper, brass, aluminum, cast iron, etc.

A big factor in successful cutting is to properly support the body and torch to as great an extent as possible commensurate with the steady forward movement of the torch. The position must be an easy one, as muscles under tension will cause vibrations and these are fatal to good cutting. An ideal position for an operator, is shown in Fig. 263, although in actual, everyday practice one usually has to be satisfied with less desirable conditions.

Theoretically, with the cut once started the oxygen jet alone should be sufficient to keep up the combustion, as there is considerable heat generated in the process. However, the stream of oxygen is small and the burning metal confined to a very narrow slot, and scale, dirt, sand, blowholes and other things interfere to prevent the continuation of the cut of the jet without an accompanying heating flame.

A cutting torch is lighted in the same way as for welding, except allowance must be made for the drop in the oxygen pressure when the cutting jet is turned on. This allowance can be made by regulating the flame while the jet valve is open, which is done before starting to work.

When the flame is adjusted, hold the torch as shown in Fig. 264, the left hand grasping it well toward the head and the right hand on the handle with the thumb or fingers controlling the jet lever valve. The metal to be cut may be a piece of heavy boiler plate, steel bar or structural steel. Rest the elbow, forearm or hand on the plate to steady the torch. It is usually best when cutting without a guide wheel, to arrange to cut either to the right or to the left rather than toward or away from the operator. However, an operator should learn to cut in any direction. When it is possible, always start on the edge. Hold the flame on one spot until it is a nice red, then turn on the high-pressure oxygen jet. Hold the torch steady with the luminous cone almost touching the metal, until the cut goes through. Sparks should show as in Fig. 265. If they fly, as in Fig. 266, the cut is not going through.

XXII. Cutting With the Gas Torch*

Details of the construction of the more common makes of cutting torches have already been given on page 1082, Vol. 50. This installment also gave tables of gas pressures and cutting speeds. On page 61, Vol. 51, a typical cutting unit was shown and instructions given for lighting the torch. In this article directions are given to the beginner as to how to use the torch and cut metal.

(Part XXI was published in our April 8 issue.)

*For author's forthcoming book, Welding and Cutting. All rights reserved.

FIG. 263. AN EASY CUTTING POSITION

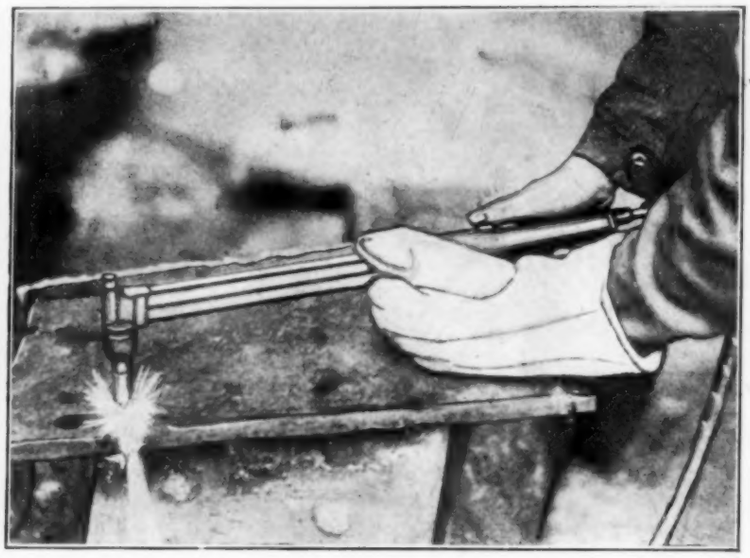


FIG. 264. STARTING A CUT WITH A DAVIS-BOURNONVILLE TORCH

In the cutting of plates, it is advisable to tip the torch head in the direction of the movement, once the cut has progressed a little. This rule does not apply in the case of blowing holes in metal where the nozzle must be tipped away from the slag so that no particles will impinge on the orifices or a back pressure be created on these orifices.

If the metal is very thick, the oxygen pressure will have to be high. In beginning a cut of this type, it is necessary to blow the oxide out at the bottom before the cut has traversed very far into the body of the metal, otherwise, a pocket will be formed and it will be impossible to penetrate to the bottom of the metal. In cutting heavy material, success depends entirely upon the ability of the individual. The nozzle must be turned outward in preheating and must be carried inward with the tip gradually moving to a vertical position and finally forward as the cut progresses. In blowing holes as in Fig. 267, the metal must be blown away from the tip, and to accomplish this it is advisable to begin with a very wide kerf, produced by rapid movement of the torch sideways while carried away from the origin of the cut. In this way the oxygen penetrates deeper into the metal while the torch is moving, until, finally, the oxygen emerges at the bottom, when the torch can be brought to a final cutting position and the metal cut in any direction.

Rivet head cutting in shipyards is generally accomplished by means of a specially designed nozzle, which rests upon the plate so that the preheating jets and cutting jet will act at the base of the rivet head as shown in Fig. 268. In blowing out countersunk rivet heads, the same procedure must be followed as in blowing holes, but more precautions are necessary in order that particles of metal do not impinge on the preheating orifices and clog them or cause backfire.

The "nicking of billets" became very common during the war. A narrow, shallow cut is made on one side or around the circumference of a steel section, then the billet is snapped off at the nick in a press or hammer.

When a cut must be reasonably smooth, use wheel guides, if possible. If a straight line must be followed, a bar of metal may be clamped to the work as shown in Fig. 269. A good way to both guide the cut and support the operator's hand, when cutting ship plates is shown in Fig. 270. This principle may be applied to other work.

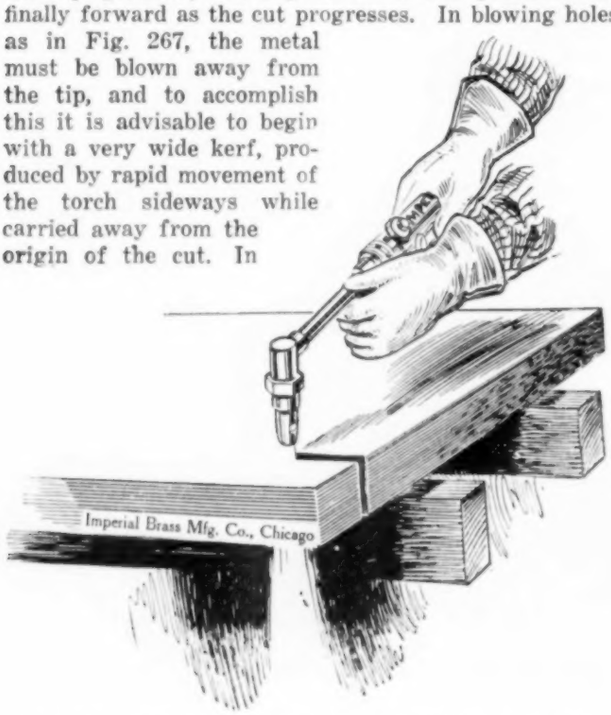


FIG. 265. MAKING A CLEAN CUT THROUGH A PLATE

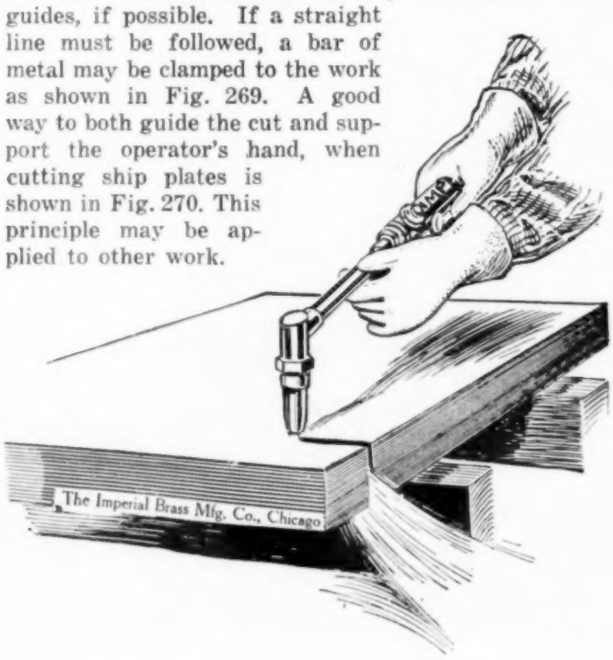


FIG. 266. CUT NOT GOING THROUGH PROPERLY

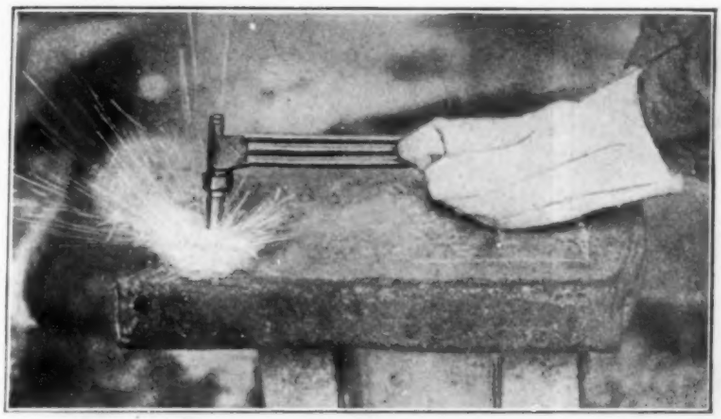


FIG. 267. BLOWING A HOLE THROUGH A PLATE

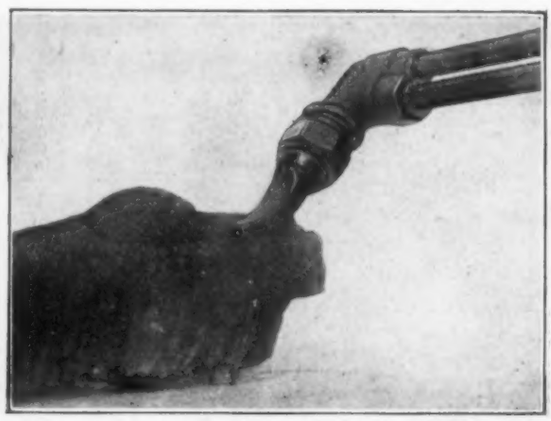


FIG. 268. CUTTING OFF A RIVET HEAD

For cutting circles, a radius attachment is used, similar to the one shown in Fig. 271. This device is made by the Carbo-Hydrogen Co., Pittsburgh, Pa., but practically every torch manufacturer makes something of the kind.

The way the cut on a 12-in. shaft looks, is shown in Fig. 272. This was cut with an Oxweld low-pressure torch. The chalked arrows indicate a blowhole and a crack which materially retarded the cutting. This cut took 3 min. 27 sec. and about 75 cu.ft. of oxygen was used. A similar cut, under similar conditions, but made without encountering any flaws in the steel, was made in 3 min. 10 sec. and 67 cu.ft. of oxygen was used.

On work 1 in. thick or over, a slot of from $\frac{1}{16}$ to $\frac{1}{8}$ in. is about right. For thinner stock, or when using a machine, the slot may often be reduced to less than $\frac{1}{16}$ in. by a skilled operator with special tips.

Flame Control

In working hold the flame so that the end of the cone just clears the metal—do not attempt to plunge it down into the cut. When cutting two plates or more, or where there is a lap joint, remember that there is more or less of an insulation (air, dirt, etc.) between these plates and that the oxidation cannot be as fast as where only one thickness is cut. Remember that the flame does not do the cutting—therefore, work with the smallest flame possible—it means a neater cut. Keep the oxygen pressure as low as possible and yet maintain speed. A high pressure is spectacular and there are a great number of sparks, but it is not economical and a wider kerf is made. Do not use the torch with greasy gloves—a spark in combination with a leak on the oxygent supply will badly burn the hand. If a cut must be started in any place except on an edge, drill a hole or use a cold chisel and a hammer to roughen up the surface, the idea being to get an edge to quickly start oxidation.

Making a Ladle Hook

As an instance of the many savings that may be obtained by the intelligent use of the gas-torch cutting process, the following will be of interest:

At one of the shipyards scrap ship plates are cut into special shapes for building up large hooks like the one shown in Fig. 273. These hooks are used for handling large ladles in a near-by steel mill and have resulted in a great saving.

The hooks are 8 ft. in total length and are made up of six layers of plates which run the full length, and four short layers, all securely held together with countersunk rivets. The four inner plates are each $\frac{1}{2}$ in. in thickness. The two outer full-length plate are of $\frac{3}{8}$-in. material. Adjoining the latter plates on either side is a half-length plate $\frac{1}{2}$ in. in thickness. The hook proper is still further reinforced by two slightly shorter outer plates, each $\frac{7}{8}$ in. in thickness.

The plates are first marked with the aid of a templet to serve as a guide for the cutting torch. After cutting, they are assembled and riveted as shown in the illustration. A laminated construction of this sort is not only exceptionally strong, but is a decided economy, as it makes use of what would otherwise be waste material.

Firemen are frequently confronted with locked steel doors or barred windows. These readily yield to a properly applied cutting torch. Fig. 274 shows a fireman demonstrating how an Oxweld emergency cutting outfit may be used. The entire kit weighs 118 lb.

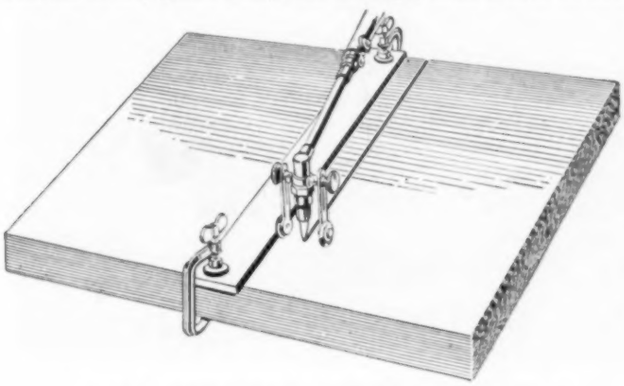


FIG. 269. USING ROLLERS AND A BAR GUIDE

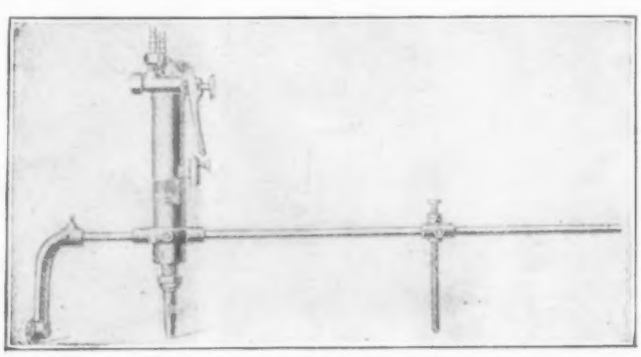


FIG. 271. RADIUS CUTTING ATTACHMENT FOR STRAIGHT-TIP TORCH

FIG. 270. CUTTING SHIP PLATES

FIG. 272. A 12-IN. SHAFT CUT WITH A GAS TORCH

A very wide field for the cutting torch is in reducing scrap to workable dimensions. The figures here given regarding the cutting of scrap, are taken from a bulletin issued by the Oxweld Co. Where costs are quoted the estimates should be about doubled for present conditions (1920).

An operator recently cut two twenty-ton steel fire boxes into scrap, prepared for the shears in twelve hours. More than 300 lin.-ft. of cut was made through ⅞-in. plate (considering the mud ring and over-lapping plates). The total cost for oxygen, acetylene and labor was $24.10 per fire box—cost per ton $1.22.

In another case a locomotive boiler was cut into scrap at a total cost of $2.63, the number of lineal inches cut totaled 210 through ½-in. plate, 9 through 3-in. plate and 172 through ⅞-in. plate. This amount of cutting was completed in fifty-three minutes at a cost of 8 cents per foot for the various thicknesses. The foreman in charge of this job stated that the work done by one operator in one and one-half days would require the services of two men for, at least, a week, with ordinary working methods.

A ten-ton boiler was reduced to scrap ready for shears by one operator in nine hours at a total cost of $16.00 or $1.60 per ton.

On another piece of work, the operator cut 78 ft. of ½-in. plate in two and one-half hours. One piece of this plate, 18 ft. long, was cut in 13 min. The cost of cutting the 78 ft. was $4.25 or $0.054 per foot through the ½-in. plate at a rate of over 30 ft. per hour.

A three-ton boiler averaged $2 per ton cut in one and one-half hours. The total length of cut equaled 60 ft. 4 in. It would have cost $3 to $4 per ton to cut this boiler by hand.

A fourteen-ton boiler was cut at the rate of $1.23 per ton in nine hours and at a total cost of $17.38. One hundred and eleven feet eight inches of cut was made at the rate of $0.149 per foot.

Three fire-box boilers weighing ten, twelve and fourteen tons respectively were scrapped at the average rate of $1.40 per ton. The users of this plant state that the apparatus enables them to cut into scrap five locomotives where one was handled by the methods used before the Oxweld process was employed.

Cutting steel car frames into scrap shows equally important savings in time and money.

A five-ton car frame was cut in two and one-half hours at an average cost of $2 per ton. It was cut into 4½-ft. lengths through three and four thicknesses of plate in some parts of the frame.

A record kept of cutting about 12,000 lb. of wrecked steel car frames shows a total cost of $8.10, or about $1.35 per ton. These frames were cut into 4½- to 9-ft. lengths, in five hours.

FIG. 274. FIREMAN DEMONSTRATING AN EMERGENCY CUT

FIG. 273. LADLE HOOK MADE OF TORCH-CUT PLATES

Nichrome: A Heat-Resisting Alloy

EDITORIAL CORRESPONDENCE

Everybody remembers the red, white, and blue barrels so prominently displayed a year or two ago on the busiest corners of busy city streets, each barrel bearing a placard exhorting passers-by to drop therein peach stones, cocoanut shells, and fruit pits of every kind; the same being the raw material from which was to be made the peculiarly absorbent carbon that was the vital principle of the masks worn at times by our soldiers in France, to protect them from the effects of the deadly gases poured so lavishly into their trenches. The carbonizing of this material required excessively high temperatures, entailing all sorts of trouble with containers. It was not until the alloy called "Nichrome" was considered that a material sufficiently refractory to withstand the high temperatures involved, and at the same time capable of lending itself to the solution of constructional difficulties, was found.

NICHROME is a metallic alloy compounded from nickel, chromium and iron. Its melting point is about 2,750 deg. F. and it may be cast in sand molds in practically any form and in weights up to 5,000 lb. Owing to its high fusion point, it is melted in electric furnaces. It has a tensile strength of from 50,000 to 55,000 lb. per square inch when cold and possesses in a remarkable degree the property of maintaining a large portion of this strength at temperatures that would render iron or steel non-resistant.

There is a distinctive reduction in physical strength of ferrous materials when subjected to high temperatures that renders them useless for many purposes. Though certain experiments have shown an increase of 32 per cent over normal in the tensile strength of structural steel when heated to 400 or 500 deg. F., and 16 per cent in the case of ordinary wrought iron under similar conditions, the strength of either material is reduced to less than 16 per cent when the temperature has reached 1,500 deg.; while nichrome, at this temperature, has a tensile strength of 24,500 lb. per square inch or nearly 50 per cent.

Nichrome is further peculiar by reason of its ability to withstand continuous high temperatures without warping, cracking, swelling and blistering; and with little oxidization. The slight film of oxide which forms in an oxidizing atmosphere at high temperatures does not crack or scale off; it resists the action of strong alkalies, and of sulphuric and muriatic acid; and protects the metal against further oxidization when it is again exposed to heat. Because of these qualities, nichrome is peculiarly adaptable to the construction of receptacles for the annealing, case-hardening, or other heat-treatment of steel, as well as for electrical-resistance elements for heaters, rheostats, etc.

When steel or iron is used for annealing boxes, the original casting must be made quite thick because of the propensity of this material to scale away and be eventually consumed; while boxes of nichrome may be made as thin as is consistent with mechanical strength.

The average life of boxes of ferrous material subjected to temperatures up to 1,700 deg. F. is about 150 hr. as against 7,500 hr. for nichrome boxes; thus, while the first cost of nichrome is greater than steel, the operating cost is less in the case of the former because of its longer life.

Figs. 1 and 2 show some of the forms of receptacle into which nichrome is cast by the Driver-Harris Co., of Newark, N. J. Another important application is that of the dipping basket used for immersing small pieces in the cyanide hardening bath, and it is also used around pickling vats where small articles are to be treated with acid.

Cast nichrome is being substituted for other materials in many parts of glass-making machinery, for melting, pouring, conveying and rollng molten glass; the nichrome molds are less affected by the high temperatures and produce more highly polished glassware. Also, because of their greater strength while hot, they can be made much lighter than the parts they have displaced.

One very important service to which nichrome was adapted during the war was the making of special retorts used for producing vegetable carbon which formed the important part of the gas masks worn by the soldiers in the trenches. This carbon was made from fruit pits, cocoanut shells and similar material which was passed through two carbonizing processes; one of which necessitated a very high temperature and also involved manipulation of the material while under heat.

FIGS. 1 AND 2. NICHROME CASTINGS

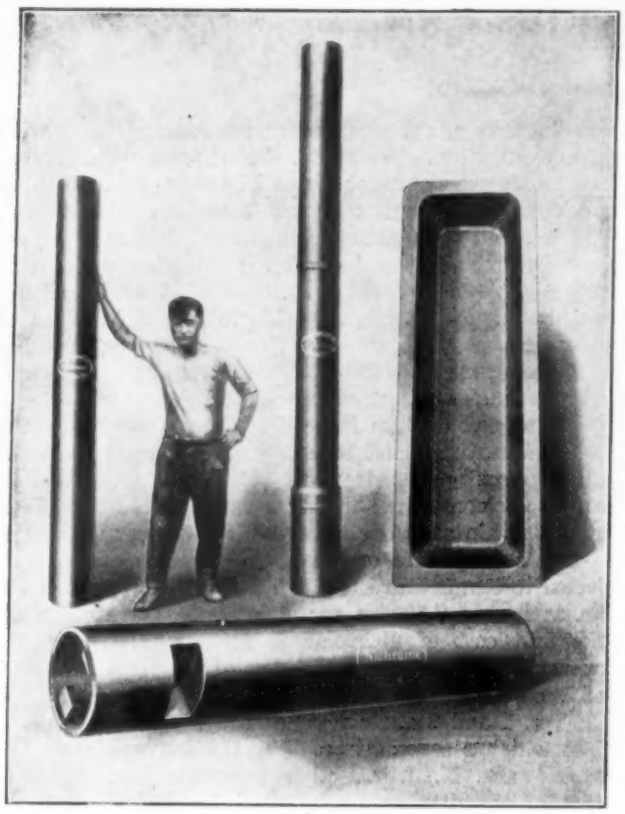


FIG. 3. TUBES USED FOR CARBONIZING RETORTS

Of all substances tested for the purpose of making gas-mask carbon by the Chemical Warfare Service, cocoanut shells were most satisfactory; that is to say, considered weight for weight, the carbon made from cocoanut shells would absorb more poison gas, and absorb it more readily and efficiently than carbon produced from any other source.

The shells were first broken in small pieces and then carbonized in coal-gas retorts at temperatures ranging from 1,750 to 1,850 deg. F. During this first process, the material lost about 70 per cent of its original weight. After coming from this process, the carbonized pieces were passed through a rotary grinding machine where they were reduced to a coarse powder which was then screened between 6- and 14-mesh sieves. Material that would pass the finer screen was allowed to go to waste as far as the making of gas masks was concerned.

The second carbonzing process or "activating," as it is called, was for the purpose of removing the hydrocarbons which are always present to a greater or less extent in all carbonized material; leaving a pure, porous, and highly absorbent carbon in condition of highest efficiency for the work it was intended to do.

The operation was conducted in a specially designed furnace, in which the carbon was raised to a temperature of 2,300 deg. F. in contact with steam. Iron or steel retorts, especially in contact with carbon, would break down long before this temperature was reached; receptacles of fireclay or similar refractory material were too fragile and their heat conductivity too low. It was not until the experimenters tried nichrome that a metal was found capable of withstanding the high temperature over a satisfactory length of time.

The carbonizing machinery consisted of a firebrick furnace, within which was placed a tube of nichrome, 15 in. inside diameter, $\frac{3}{8}$-in. wall, 13 ft. 6 in. in length, and weighing 1,850 lb. Such a tube may be seen in Fig. 3. This tube rested upon roller supports 10 ft. apart, and lay at an angle of about 10 deg. from the horizontal. It was kept in continuous rotation during the carbonizing process by means of a chain and sprocket at one end.

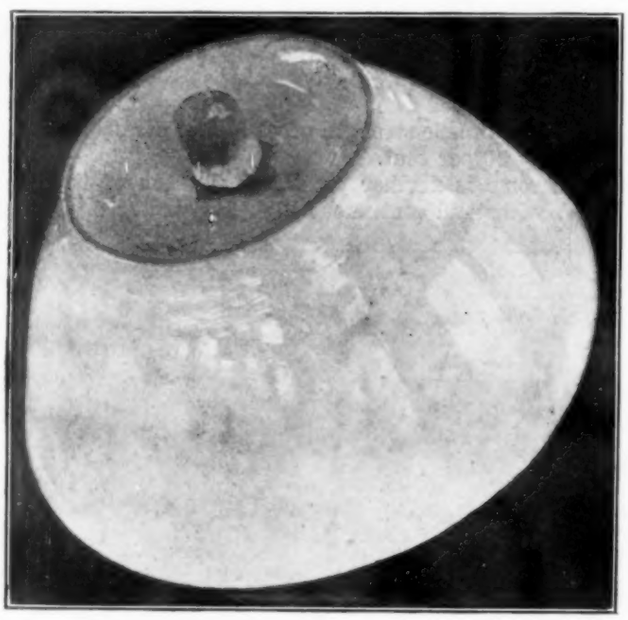
Steps or vanes of nichrome were bolted to the inner surface of the tube for the purpose of keeping the contents agitated, and steam was admitted throughout the length of the tube through specially constructed jets of the same metal. These revolving retorts were run continuously, producing from 100 to 150 lb. of charcoal per hour. As the entire central section of the tube was held at a dazzling white heat all the time, it is small wonder that the life of such a tube was but five or six weeks—though there is a record of one having run for 11 weeks before breaking down.

A Pattern Made From Odd Material

BY E. A. DIXIE

I have been knocking around pattern shops and foundries for nearly 40 years and up to a few days ago believed I was familiar with all the pattern makers' and founders' materials, from the proverbial "molder's thumb" (always referred to as the pattern used when the casting is not "to pattern") on up to some particularly fancy molds, which were gold plated to prevent discoloration of the plaster which was cast in them by a Philadelphia firm of near-meerschaum pipe makers.

On the boss patternmaker's bench yesterday I saw the pattern shown in the illustration. A customer brought in an earthenware bowl which he wished reproduced in iron, but a boss was to be cast on the bottom. The boss, an ordinary 1-in. core print was secured to the bowl with shellac varnish. The varnish was applied to both the bowl and the print and allowed to dry till it was very "tacky" when the print was applied to the bowl and the varnish allowed to set.



PATTERN MADE FROM AN ODD MATERIAL

The Manufacture of Household Appliances—III

BY J. V. HUNTER
Western Editor, *American Machinist*

Work of the character dealt with in this article must be rapidly machined and it is necessary that the fixtures allow the placing and removal of the work with the least effort on the part of the operator.

(Part II was published in last week's issue.)

IN the plant of the Hurley Machine Co., Chicago, Ill., manufacturer of the Thor line of household appliances, many of the castings that require lathe operations are handled on Potter & Johnson manufacturing automatics, of which two men usually attend a battery of six. One machine for work on the gear housing of the wringer is shown ready for operation in Fig. 14. A pneumatic chuck is used and it will be noted that the jaws enclose nearly the entire casting.

Several of the larger gear housings for the washing machines are also finished on these machines. One employs a Barker wrenchless chuck, Fig. 15, holding the casting, which is additionally clamped at *A*. Many types of chucks are found on these machines, but the ones having labor saving features are in decided favor with the workmen, who are operating on a piecework schedule.

Some hand-operated turret lathes fitted with air chucks are used for such work as boring and facing the hubs of gears. Many different types of machines are represented in the gear cutting department. The Pratt & Whitney gang milling machine, Fig. 16, is shown roughing out eight small bevel pinions at a time, previous to the finishing operation in a Gleason gear shaper.

Milling Operations

Numbers of special fixtures have been designed for milling machine operations with a view to increasing the accuracy and production on work of this character. A small drive shaft, *A*, Fig. 17, is milled with a square end, and for this operation it is clamped in the fixture *B* by the chuck which is tightened by a quarter turn of the spanner wrench *C*. One pass through the cutters finishes two sides, thereupon the clamping screw *D* is loosened, the index pin *E* withdrawn and the chuck revolved 90 deg. to a second stop, and the shaft again fed into the cutters to finish the other two sides.

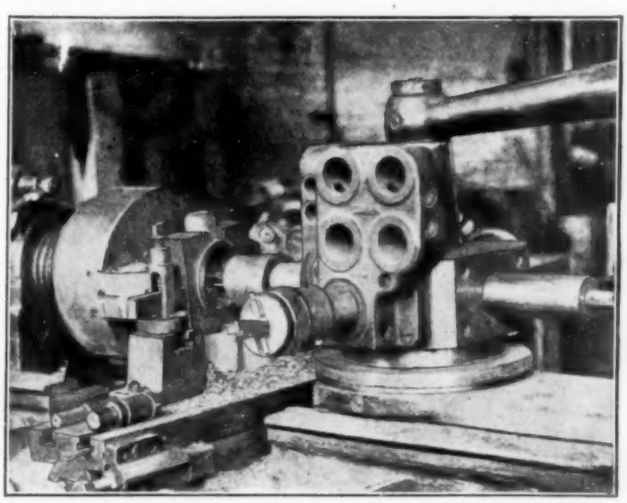


FIG. 14. OPERATIONS ON A BEVEL-GEAR HOUSING

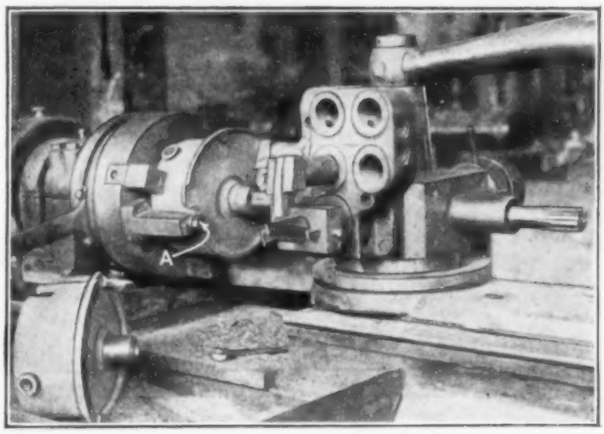


FIG. 15. FINISHING THE GEAR CASE

The keyways in six of these same shafts are cut simultaneously while they are held in a fixture on a milling machine, as in Fig. 18. The shafts lie in V-grooves, parallel with the fixture, and are clamped by the T-head studs A, which are drawn down in pairs by the levers *B* beneath the fixture.

The ends of the collars *A*, Fig. 19, are milled by using the indexing fixture and milling cutters shown in the illustration leaving the rib *B*. The collars are placed in pairs on the studs *C* and clamped by the cross bars *D*. The fixture is indexed by drawing the index pin *E* and loosening the center tightening clamp *F*. Each movement brings a fresh pair of collars in line with the cutters and while they are acting the operator removes a finished set and replaces it with fresh ones.

The polishing shoe of the ironing machines is a long thin casting which must be finished on the inner face to a smooth polished surface so that it will impart the proper degree of gloss to the laundered pieces. This surface is obtained by first milling to sufficient depth to get a clean surface and later by polishing on a fine grit rag-wheel and felt buff. Preliminary to the milling operation the inside faces of the castings are smoothed off by the portable flexible-shaft grinding machine shown in Fig. 20.

The milling operation is done on an Ingersoll planer-type milling machine, Fig. 21. The flexible nature

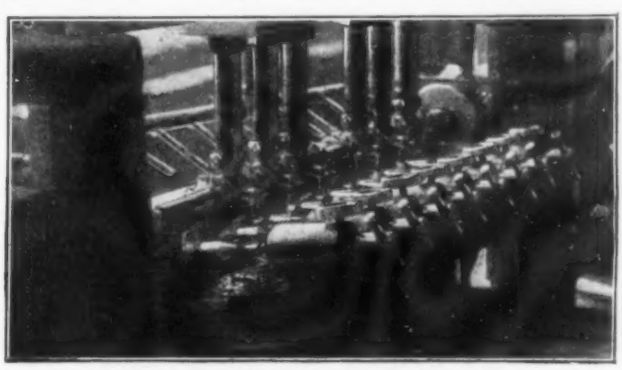


FIG. 16. ROUGHING BEVEL PINIONS

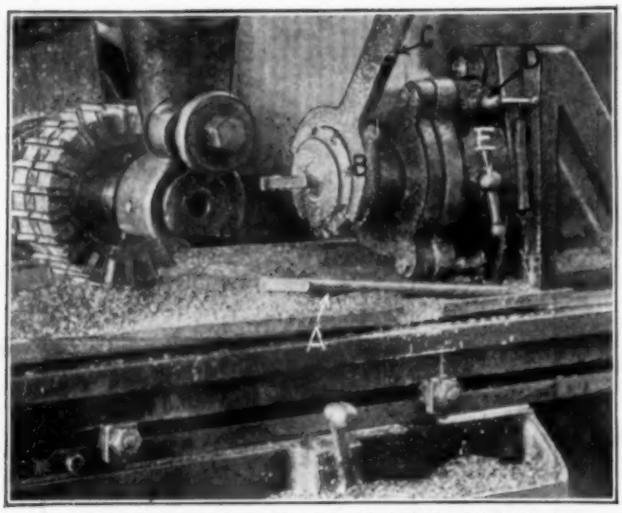


FIG. 17. MILLING SQUARES ON ENDS OF SHAFTS

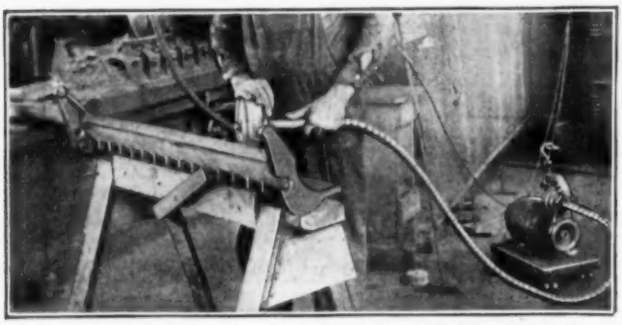


FIG. 20. SMOOTHING A CASTING BEFORE MILLING

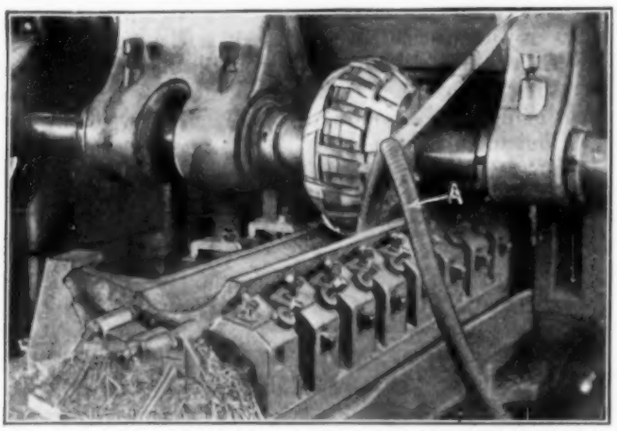


FIG. 21. MILLING THE FACE OF AN IRONING SHOE

FIG. 23. SPOT WELDING VANES ON FANS

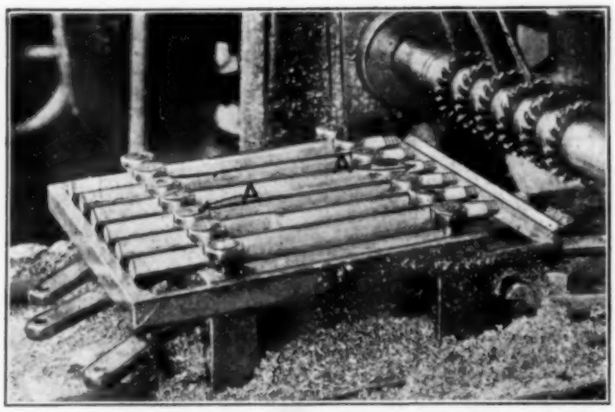


FIG. 18. CUTTING KEYWAYS IN SIX SHAFTS AT ONE SETTING

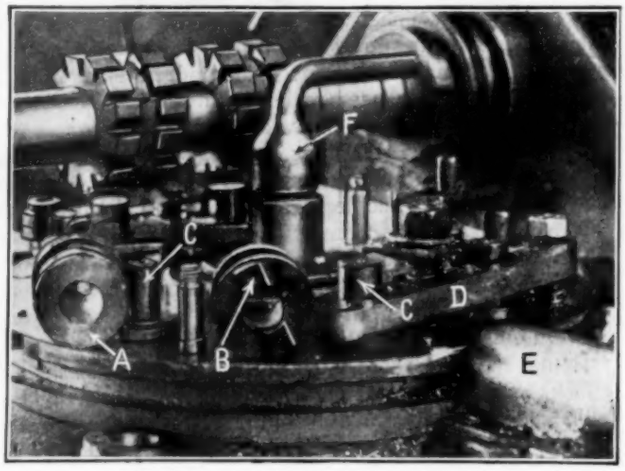


FIG. 19. AN INDEXING FIXTURE

FIG. 22. SOLDERING RIBS ON CYLINDER COVERS

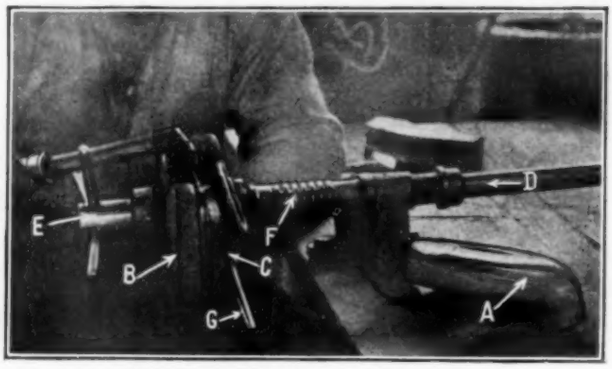


FIG. 24. WELDING FAN BODIES

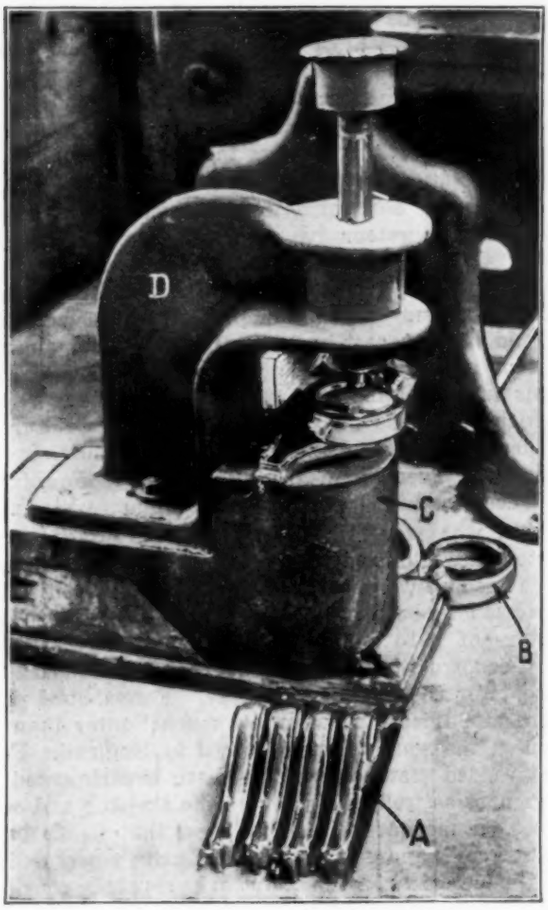


FIG. 25. SEAMING FLANGES OF FAN BODIES AND NOZZLES

of the casting necessitates that it be supported at close intervals throughout its length and the illustration shows the fixtures with its numerous clamping and supporting brackets. A large inserted-tooth cutter finishes the entire surface, including one edge, at a single pass through the machine. To clear the chips from the cutters a powerful blast of low-pressure air is sent through the flexible tube *A*. Some of the small units are assembled to make them more convenient for quick work when they go to the final major assembling operations. Many little devices are used for so positioning the parts that there will be no fitting trouble later on.

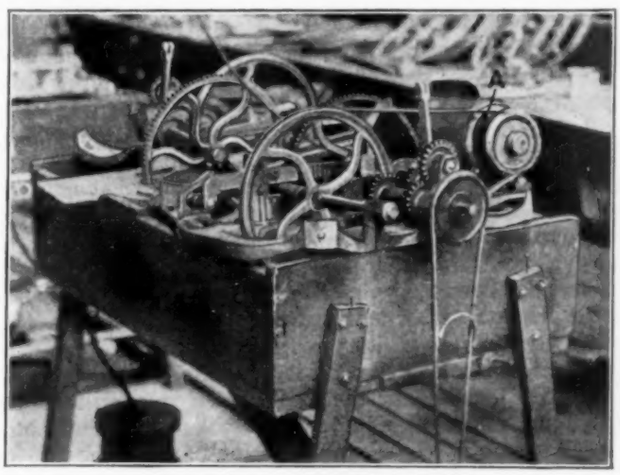


FIG. 27. A TESTING STAND

FIG. 26. BUILDING CYLINDERS FOR WASHING MACHINES

A simple fixture for soldering ribs on the insides of metal cylinder covers for washing machines is shown in Fig. 22. A few wooden pieces held together by metal strips serve to hold the ribs in their proper position while the operator solders them in place. This device also insures that the heat of the soldering iron will not cause the ribs to spring away from the cover so that the joint will loosen before the solder has a chance to set.

The vanes for vacuum cleaner fans are attached to the web as indicated at *A*, Fig. 23, by a series of spot-welds through their flanges which secure them along almost their entire length. The results obtained are more secure than if small rivets were used.

The fan bodies are made of two steel stampings, *A*, Fig. 24, placed together and the seams welded with an oxy-acetylene torch. The two pieces are placed in a fixture that holds their edges in alignment. Two hollow castings *B* and *C* enclose the stampings with the exception of an open space of half an inch along the seam which is left to give the operator room to operate his torch for the seam weld. The container castings are a sliding fit on the arbor *D*, and the operator removes the pilot *E* and the container *B* to place the stampings in position. In closing the fixture the pilot wheel draws up on the threaded end of the arbor and brings pressure to bear against the inside castings, forcing it against the spring *F*. The spring insures constant pressure on the work preventing it from either jarring loose or buckling from too great pressure due to the expansion caused by the heat.

The operator can revolve the work on the arbor as he progresses along the seam, by means of the small spoke handles *G* in the casting.

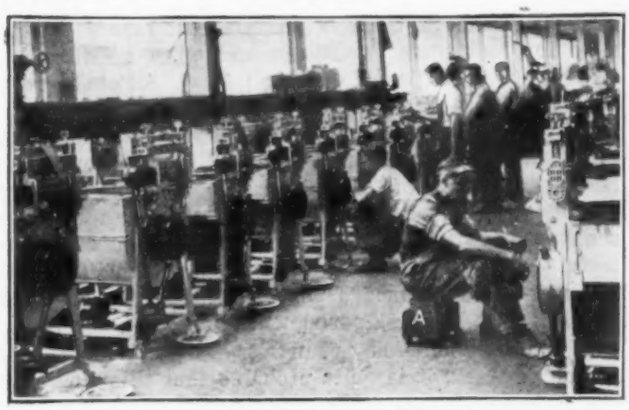


FIG. 28. INSPECTION OF FINISHED MACHINES

The nozzle *A*, Fig. 25, is made of two stampings welded in a similar manner. After welding, the part is taken to a grinding wheel where the surplus metal left on the seam is ground off preparatory to plating.

The nozzle together with the fan housing *B*, is placed on the anvil *C* of the staking press *D*, where the fixture holds them in alignment while the flanges on these two parts are seamed together by a die carried on the plunger. Several heavy blows with a sledge on the copper head of the plunger are required to complete the operation.

The wood cylinders of washing machines are made of maple and are assembled in lots of twenty by two workmen, Fig. 26, and one operation is followed through the whole lot before the workmen turn to the next operation. As here shown the trunnion casting and the lock which secures the cylinder in the tub are being fitted on.

A stand for a running test on the operating mechanism of the wooden-tub washers, Fig. 27, serves to hold two units while they are driven during the test by the motor *A* mounted on the rear of the frame. The final assembling is group work and one unit is placed on each machine before proceeding to place the next unit on any machine of the group.

Larger groups are handled when assembling the smaller household units, Fig. 28, and as here shown the assembly is practically completed, and the inspectors are engaged in testing the operation of the gear mechanism. The workman at the right has fitted up a small stool, *A*, with casters, and on this he is able to push himself from one machine to the next as he proceeds with his inspection.

After assembly, inspection and cleaning, the machines are given their coats of paint by spraying.

Sidelights on Automobile Building

By I. B. Rich

THERE are several phases of the automobile-building game which are not only of interest to the engineer, but which have a direct bearing on the question of manufacturing equipment, getting back in this way to the machine-tool field. The inability to secure steel and other materials has reduced the output of many automobile builders from 50 to 60 per cent of their estimates. Others have speeded production methods so successfully that they could exceed their estimates considerably if material was obtainable.

Steel, however, is not the only thing which is holding up production. Glass for windshields and windows of closed bodies is also very scarce. In fact the demand by the automobile builders has made it almost impossible for builders of dwellings and office buildings to secure sufficient glass for their needs. Another great shortage is in malleable-iron castings, which are so largely used in motor truck work for rear-axle housings and similar parts. Several thousand tons a month are needed in and around Detroit, as the malleable capacity of the country seems to be completely taken up. In some cases this is leading to the substitution of sheet-metal parts, and the change, once made with its initial expense for dies, means that the malleable-iron field will lose this business permanently.

If the aluminum-alloy foundries were not themselves so full of work, it is quite probable that this would be their chance to take over many parts which we have heretofore made of iron and steel castings, in spite of the increased cost. The new aluminum alloys under various trade names are so much stronger than we used to believe possible, that they are being used to some extent for rear-axle housings and wheel centers on heavy truck work. This has the advantage of reducing the unsprung weight which saves tires and fuel expenses.

The use of aluminum in motor work is a disputed point among automotive engineers, its use in pistons being the place where pro and con arguments wax hottest. Its opponents point to the makers who have tried aluminum pistons and have abandoned them for the old standby, cast iron. On the other hand, aluminum pistons are being used under the extreme heat conditions in the Franklin Motor and both the Essex and Oakland are also using them in water-cooled motors, while Marmon uses a combination of aluminum and cast iron. Then too, nearly all airplane motors, both in this country and elsewhere, use aluminum pistons.

But, whatever the outcome, the advantage of light pistons are admitted and advocates of cast iron are trying to reduce weight as much as possible. British practice has long been toward light pistons, some of the small motors of 1914 having cast-iron pistons of extremely light construction, a few of them being machined all over except for the piston pin bosses. Forged-steel pistons were also tried, but were not much lighter than cast-iron in the small diameters used in England. Forged and welded pistons have also been experimented with over here as well as pistons of the skeleton and slipper types. Experiments seem to show that lightening the pistons adds appreciably to the effective power delivered by the motor, which is a point to be carefully considered.

The desire for lightness is also leading to better steel alloys so as to allow of lighter sections and even some of the medium-priced cars are now machining the connecting rods all over, in order to secure minimum weight and aid in securing a good running balance. Experiments with molybdenum steel indicate that it is much better in every way than previous alloys and it is expected that advocates of light, thoroughly high-grade cars will make use of it to secure maximum strength with minimum weight. With this material, it is believed that a comparatively large five-passenger car can be kept very close to 2,000 lb. in weight.

Aluminum alloys are also being experimented with, particularly in forgings for parts where the reciprocating weight is so important. These experiments are not being confined to the higher priced cars but are being carried out in motors of even small powers and low prices. With the tendency toward higher-speed motors, the question of balancing becomes more acute, as does also the necessity for smooth-running motors. In spite of this there are comparatively few motor builders who test the crankshaft and assembled units for running balance. The contention is made by some that running balance machines are of little use at speeds over 500 r.p.m., but this does not seem to be borne out by the experience of builders of other kinds of machinery. There is, however, a growing belief among engineers that the use of a running balance machine is the only way in which satisfactory results can be secured, as even slight variations in the density of metal in various parts of the crankshaft, or the parts which go with it, make a decided difference in the final balance of the motor itself. It also plays an important part in the life of crankshaft bearings.

A Special Fixture for Milling Rails for Automobile Frames

By R. A. WILSON

This article tells how a standard machine, by the use of a special fixture, was adapted to large-scale production work upon one part of an automobile frame. The method of operation is a little unusual as it makes use of a "floating arbor" for holding the cutters.

IN THE manufacture of the Autocar 2-ton truck an unusual type of fixture is used for milling the flanges of the frame rails, which are pressed chrome-nickel steel channels. The tops of the flanges are milled to maintain a uniform height, since they must be flush with the wooden rail which is pressed in between them, as shown in Fig. 1.

In order to give clearance for the radii in the corners of several brackets it is also necessary to chamfer the tops of the flanges at several points. The operation of chamfering the rails under the old method of grinding was slow and difficult. To increase the production and

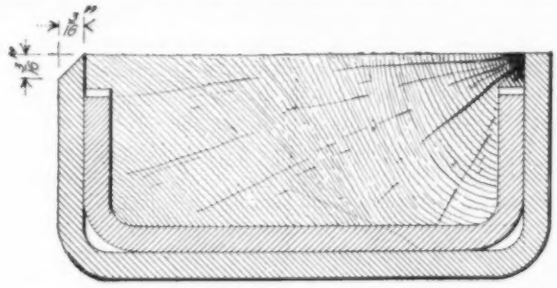


FIG. 1. SECTION OF RAIL USED IN FRAME OF THE AUTOCAR

improve the quality of work a fixture was designed which would mill off the tops of the flanges and chamfer them at the proper points simultaneously. Fig. 1 shows a section through the frame rail at one of the chamfered points.

Fig. 2 shows a photograph of the machine and fixture for doing this work. *A* is the body of the fixture, *B* the cutters and *C* the carriage for holding the rails, which is supported by the two rollers *D* at each end. *E* is a sheet-metal trough which collects the cutter coolant and returns it to the pan underneath the machine.

Fig. 3 is a sectional view looking along the length of the fixture from the right side of the machine. *Z* is the arbor, *A* the body of the fixture, *U* the table of the milling machine, *V* the saddle and *W* the side of the knee of the machine. It may be noted here that the fixture does not change position and that during operation neither the knee, saddle nor table move.

The body of the fixture *A*, Fig. 3, is a casting of rectangular box construction and is securely bolted to the table of an Aurora milling machine of early design. The rail to be milled is mounted in the carriage *B*, Figs. 3 and 4. Referring to Fig. 4, the rail *A* is located endwise by the fixed stops *C* and secured in this position by the clamps *D*. The carriage consists of a flat machine-steel plate *B* which is somewhat longer than

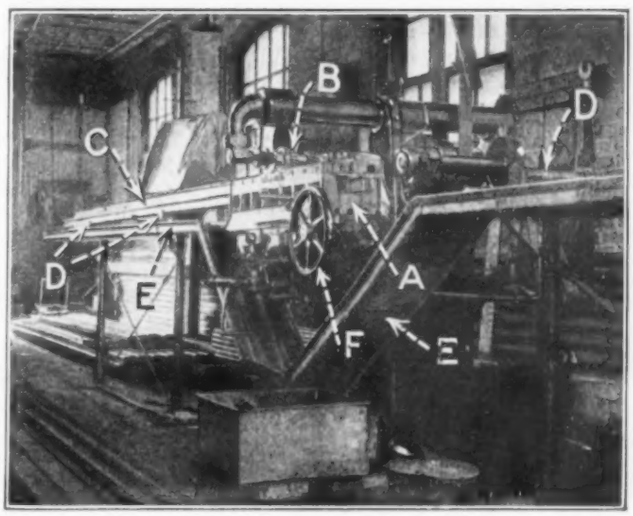


FIG. 2. MACHINE AND FIXTURE USED FOR MILLING FRAME RAILS

the frame rails, and to which angle irons are bolted, the upper ones for retaining the rails and the lower ones for carrying the rack and the cam plates.

The carriage is propelled through the milled opening in the top of fixture *A*, Fig. 3, by the spur gear *C* meshing with rack *D* on the carriage, and it is held down by the machine-steel strips *E* which are bolted to the casting. The spur gear *C* derives its motion from a train

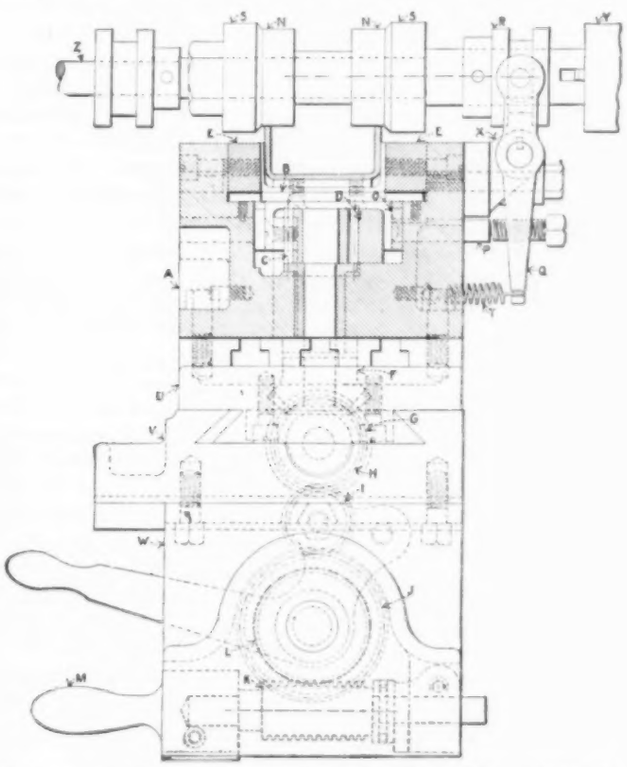


FIG. 3. SECTION SHOWING THE FEED MECHANISM OF THE CARRIAGE

of gears consisting of the two miter gears *F* and *G*, the spur gears *H* and *I*, the latter of which meshes with the large spur gear *J* on the worm-wheel shaft, which formerly drove the lead screw of the milling machine.

Method of Operation

When operating, the carriage is run all the way to the right of the arbor *Z*, which carries two standard 3-in. diameter, 1-in. face milling cutters *N* and two special 3½-in. diameter, 24-tooth bevel milling cutters *S*. A rail is then inserted and clamped in the carriage and the power feed is engaged by bringing worm *K* in engagement with wormwheel *L* by means of lever *M*.

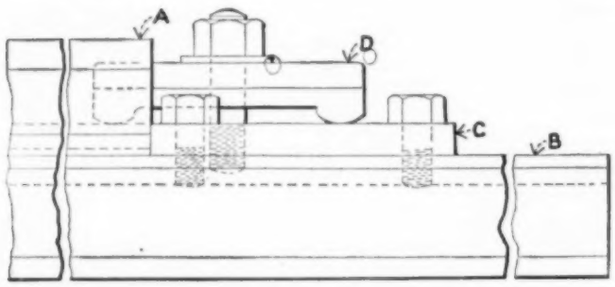


FIG. 4. METHOD OF FASTENING THE RAILS TO THE CARRIAGE

The carriage passes under the milling cutters *N* and only the top edges of the rail are milled until the camplate *O* engages the hardened plunger *P*, which is moved outward. This exerts a pressure upon the fork *Q*, which carries two steel blocks running in the groove of the hardened-steel collar *R*. This action forces the arbor in toward the rail an amount equal to the thickness of the camplate, thus bringing the bevel milling cutter *S* in contact with the rail and holding it there until the camplate passes out from beneath the plunger *P*. The action of the spring *T* pulls the arbor back to its normal position, where it remains until the next camplate engages the plunger *P*. This floating arbor *Z* slides in and out in a keyed driving sleeve *Y*, which is screwed to the spindle of the milling machine.

When the rail has passed out from beneath the cutters the feed lever *M* is disengaged, the carriage rapidly returned to its starting position by means of a handwheel, and the operation is repeated with a new rail. This handwheel is geared to the shaft upon which the gears *G* and *H* are mounted, and is shown at *F* in Fig. 2.

The Rails Are Right and Left Hand

The rails are right and left hand, due to the fact that the right-hand rail is chamfered in two places and the left-hand rail in but one place. This necessitates the placing of cams on each side of the carriage, two for the right-hand rail on one side and one for the left-hand rail on the other.

The rails are run through in lots of three hundred rights and three hundred lefts. After milling three hundred right-hand rails the plunger *P*, Fig. 3, is withdrawn and inserted in a hole provided for it in the front side of casting *A*. The bracket *X*, carrying the shift forks *Q*, is next removed and bolted on the front of the casting preparatory to milling the three hundred left-hand rails.

The production capacity of this machine is fifty-five rails per ten-hour day.

A Quick-Release Screw for Jigs

By John Wood

The accompanying drawing shows a quick-acting screw that is very simple and efficient. I use this form of screw whenever possible on all jigs or fixtures where the placing or removing of work necessitates backing out the screws for any considerable distance.

It is very simple to make, as it consists of but two parts and a few stock screws. The dimensions of the parts depend upon the conditions to be met in each case.

A represents the wall of the jig or fixture, through which a smooth hole is bored and reamed at the point and in the direction at which the screw is to be located.

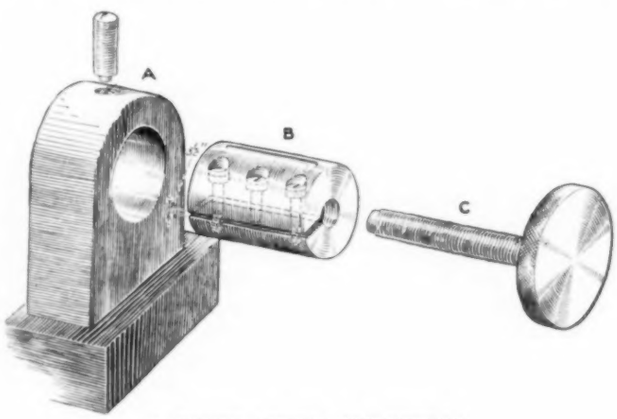
B is the nut, drilled and tapped for the knurled-head screw *C* and finished on the outside to a neat sliding fit in the hole at *A*. The screw must be nicely fitted to the nut *B* so that though it turns easily in the thread it will turn less easily than the nut itself turns in *A*. It is upon the nicety of these fits that the smooth working of the device depends.

The nut *B* is split longitudinally and three small fillister-head screws let into it in the manner shown, so that the two outer screws act to close the nut and the center screws to open it; thus by these screws the friction of the nut upon the screw *C* may be readily adjusted.

An L-shaped slot (with the short side of the L reversed) is made upon the outer surface of the nut *B*, the long side of the slot being paralled with the axis of the nut. A small headless, dowel-pointed screw is tapped into the wall of the jig so that the dowel point enters the slot in the nut when the device is assembled.

The dowel screw must fit rather tightly in its thread so that though it extends into the slot in the nut it does not bind the latter and will not work loose because of having no bearing endwise.

The operation of the device is obvious. The nut is pushed in until the dowel reaches the right-angled turn in the slot; then the screw *C* is turned in until it bears



A QUICK-ACTING JIG SCREW

upon the work. The first rotative movement is, of course, of the nut, which turns until the end of the shorter slot stops against the dowel, after which the screw turns forward until it bears against the work, the thrust of the screw being borne by the dowel.

To release the work the screw is turned back. The first movement is of the screw within the nut until the pressure against the dowel is released; then the nut turns back until the dowel stops it at the angle of the slot, when the nut and screw may be drawn out for the length of the long side of the slot.

Practical Methods of Appraisal

By L. L. THWING

If there is any one thing that is difficult to get two or more men to agree on, it is the value of second-hand machinery. In this article the author gives the results of his experiences in the appraisal of used machine tools.

APPRAISALS are made for various reasons, such as insurance, income tax reports, mortgage or sale, or for determining the depreciation factor in costs. The basis of valuation varies according to the purpose of the appraisal. Overhead is usually based on original cost, income-tax reports on value as of a certain date (for purchases prior to that date), while insurance values are based on replacement costs.

In all cases, however, the factor of depreciation appears as a necessary part of the investigation. The existence of depreciation is universally admitted, but on account of the difficulty of measuring it accurately, many shops make only a perfunctory effort to measure it at all. Depreciation is not an exact science, as its findings are more strongly colored by the personal equation of judgment than by the direct application of known facts. In this respect it does not differ from many engineering problems, except that the latter are worked out by engineers, while the former is generally in the hands of accountants. Depreciation of any specific group of equipment such as machine tools involves a knowledge of physical detail, and the particular production problems of the shop where they are located. It is dependent on information that can only be secured in the shop.

Inventory of Equipment

An appraisal includes an inventory of equipment, priced at either replacement or cost values, and a depreciated value, which represents the actual or sound value at the time of the appraisal. In a going concern the usual elements of depreciation are wear, obsolescence and lack of utility. The actual work should proceed as follows: first an inventory with date of installation; second, cost of replacement values erected; third, depreciation and resultant valuation. An inventory is simply a list of machine tools or other equipment with sufficient description to identify the various items. Describe the things that affect the cost, the unusual features rather than the features that are too generally known to need description. It is not necessary to tell what features a machine does not have, unless such an omission is a departure from usual practice.

Nearly all machine tools are rated by arbitrary numbers, or by one or more of the dimensions of the maximum-sized piece that can be machined.

Age is not prima facie evidence of wear but it implies it. Ten years difference in age presupposes additional wear, and may be said to put the burden of proof on the older machine. The office records will show the date of purchase or invoice for a large proportion of the machines, but if for any reason this is not the case, inspection and the testimony of the shop men is the only recourse. Serial numbers, if they are found, can be used, if it is desired to go to the trouble and expense of writing to the manufacturers. To tell the age of a machine by inspection is not easy. It can be done approximately only by those who have handled the machine tools for years. The second-hand dealers can do this better than any other class of men. It is doubtful if the manufacturer himself could always tell the age of one of his own machines, except through the serial numbers.

Natural advance in the art, and the advent of high-speed steel, have made many changes in design of machine tools in the past 20 years. Few of these, however, effect a radical change in the appearance of the machine. All geared feeds, drives and gear guards are the most easily noticed, but there are many others that are apparent to a man who is interested in the evolution of machine tools and has taken the trouble to inform himself.

The Value of a New Machine

The value of a new machine is its current selling price plus transportation and erection charges. Any war-time bonus in addition to this is not value. The manufacturer's price is the only basis for replacement value and the only way to secure this is through him or his agents. The additional items of freight, trucking, handling and installation may be included as one item and figured as a percentage of the cost. This is in fact the usual way, if not the most accurate. Without going to either extreme, such as bench precision lathes on one hand, or billet shears on the other, this percentage will be between 3 and 4 per cent of the cost for normal conditions.

If the appraiser will consider that the erection cost of a $2,000 planer will be three of four times as much as for a single-pulley-drive milling machine costing the same, this method will be sufficiently accurate. If, however, the shop records show these costs, they should certainly be used.

Having completed the list of machines with their actual or estimated age, together with the cost or replacement value (new); depreciation for wear, obsolescence and lack of utility are next in order. It is on the whole better to make a separate item for each of these factors as they will have different rates of change. A machine is sure to be worn more a year from now, but it may be no more obsolescent. If the appraiser is familiar with the shop's production problems, these factors may be considered at the same time, but it behooves an outsider to move slowly in matters of obsolescence and lack of utility, and if a separate item is made for each factor, the last two can be checked over with the superintendent.

As a matter of practice the bearings, feed screws, gears, etc., should be tested for backlash; broken or imperfectly repaired parts inspected; the age of the machine should be considered together with the policy and practice of the company in regard to repairs. The opinion of the operator, the gang boss and the foreman should be solicited, and checked against the facts determined by inspection.

In a well-conducted shop, where repairs are promptly made, the depreciation from wear alone will not accumulate faster than 2 or 3 per cent a year. It is more likely to be obsolescence than wear that puts a

machine on the scrap pile. A superintendent will hardly retain in active service a machine whose production is curtailed 40 per cent by wear alone. He will either repair it, replace it, or move it to some other part of the shop where the demands on it will not be so heavy.

As a check on depreciation, estimate the cost of repairs necessary to put the machine in first-class condition, and in doing this the facilities of the owner for such work should be considered. Repairs can be afforded when adequate facilities exist in the shop, but if not, repairs other than replacements of worn parts that can be supplied by the manufacturer are not usually warranted.

A machine whose annual repair bill is heavy is of diminishing value to its owner in proportion to the cost of upkeep, but it is not the function of the appraiser to consider this. The cost of repairs has gone into overhead expense, and should not be deducted from the value of the machine.

In the case of a machine so old that its original cost cannot be estimated with reasonable accuracy, it is manifestly better to give it a net value, rather than go through the form of deducting a carefully considered depreciation from an inaccurate cost.

Obsolescence

Obsolescence is the next factor for consideration and is estimated by comparing the machine with the most modern machine on the market. In the case of wear it is a question of comparison with a fixed quantity; in the case of obsolescence, a comparison with a variable. The physical condition of a machine is the same irrespective of other conditions, while the degree of obsolescence is vitally affected by circumstances and is a matter of deduction from variously acquired information and opinion. The first and most important suggestion is: Get all possible information and assistance from the production department. It can be safely assumed that this department knows the weak places in its equipment better than anyone else.

There is "style" to machinery, and an 1880 design is likely to suggest obsolescence strongly, when as a matter of fact the machine may be a better productive unit than it appears to be.

In 1916, there was in active service in a well-equipped machine shop an old chain-feed lathe so old that no one would attempt to give its age. It was then—and probably is today—standing in the carpenter shop beside a new, modern wood-turning lathe. It was used for turning wooden rolls up to 40 x 2 in. The original feed mechanism had been replaced by a belt drive giving a coarser feed to the carriage, but was otherwise the same as when it was built. The work that it turned out was light and it was not used all the time. The operator preferred it to the new lathe because the carriage was lighter and was controlled by handwheel at the head end of the lathe; consequently, it could be returned easily and quickly at the end of the cut. He preferred it because he was used to it. The new lathe could cut the time on heavier rolls, but not on the smaller ones. To what extent, then, is the old lathe obsolete? To decide this question it must be compared with another lathe that will do the same work as well or better. A second-hand engine lathe of more modern construction would not do it without some changes to the feed and the bearings might give trouble if run at high speed, so that the best machine to replace it would be a light patternmaker's lathe, which would probably cost today about $350. This would be a better all-round machine, but it would turn the rolls no better, and probably no quicker. It should be considered, however, that the utility of the old lathe depends entirely on the demand for small wooden rolls. If it should happen that these were replaced by rolls made from tubing or sheet iron (as has actually been done with larger rolls), then the value drops at once to scrap. After giving these factors proper consideration, a net value of $175 might be given to this machine.

The last factor in depreciation is lack of utility. Is the machine under consideration useful to its owner irrespective of mechanical condition or design? It is obvious that even a new machine is of no value as a productive unit unless its owner either has, or expects to have, suitable work for it. There are, for example, a number of special-purpose machines that were used in munition factories that are practically useless today. There are other machines that have only a limited sale in peace times, but were used extensively for war work. Gun-barrel drilling machines, rotary cutting-off machines and profiling machines are examples of this latter class if the owner has no work for them. In such cases the only value of the machines is their commercial value, or their value to the second-hand dealer, increased in proportion to the possibility of their again being used by the owner. Here again the advice of the shop man is invaluable, particularly in the case of standard tools that may be temporarily idle. If he has decided to sell said machines they have one value; if he intends to put them into production they have another.

Other Factors to Be Considered

In addition to the foregoing, there are two other factors that may be considered: that is, second-hand and scrap values. The actual value of any used machine cannot be greater than the cost (installed) of a similar machine in like condition acquired in the second-hand store. A few months ago many second-hand machines were offered at prices ranging from one-half to one-sixth of their present-day costs, new. Profiling machines, whose average selling price new is $1,100, were offered as low as $200. These machines are probably in good working order, and if appraised as productive units would have a value of $800. Any company owning and using ten of these machines could replace them with equally good machines at a total cost of not over $300 each.

In an appraisal for insurance purposes, the replacement value is supposed to be one that will actually replace it—or 80 per cent of it—and prices in the second-hand market are not very stable. How far second-hand values shall be reflected in shop valuation will depend on the purpose of the appraisal and the judgment of the appraiser, but its possible effect should not be entirely neglected.

The scrap value, particularly of light- and medium-weight machinery, need not be considered. The net cash return after deducting the cost of dismantling is too small a percentage of its value, and possible errors in depreciation will more than offset it. However, a machine, the major portion of whose cost is in cast iron, such as an alligator shear, would have a scrap value that should be taken into consideration. In general the heavier the machine the greater the necessity for including its scrap value.

In conclusion the writer wishes to insist that accurate depreciation is made possible only by considering each specific item by itself. It is not possible to secure accurate results by any process of averages, either average life or averages by rooms or departments. Age factors are a makeshift of accountancy, and group depreciation is no less a makeshift in appraisals. Greater accuracy cannot possibly be claimed for it, and at best it can only hope to equal the accuracy of detailed appraisal.

Finally, to repeat, do not expect the best results unless the owner or superintendent co-operates with the appraiser. The superintendent knows more about his own machinery and his future plans for its disposal than anyone else. The appraiser should not be expected to know all of these; nor should he, on his part, assume that he does.

Grinding Circular-Formed Cutter Teeth

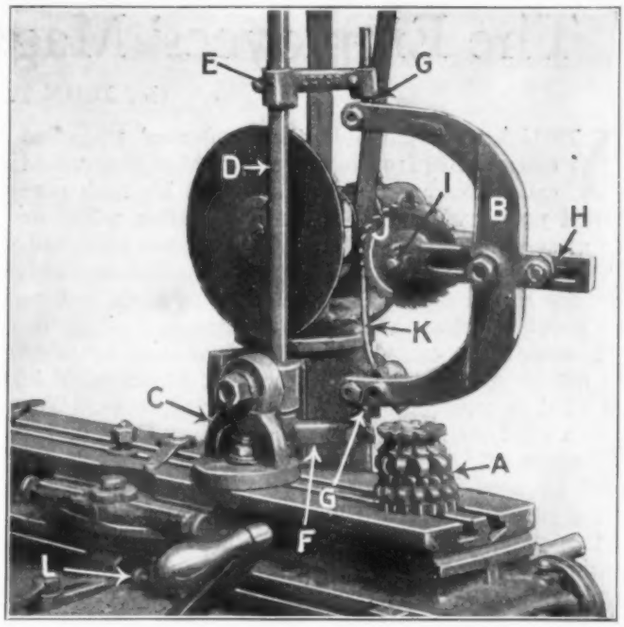
BY EUGENE E. HENRY

The accompanying photograph shows an attachment used in the toolroom of the Holt Manufacturing Co., Stockton, Cal., for grinding the tops of circular-formed teeth on milling cutters. the attachment was made at a small cost, and can be used on any type of cutter grinding machine, although it was here applied to a No. 1 Le Blonde machine. Besides being used for regrinding clearance on stock cutters, the rectangular teeth of old cutters are often rounded with this attachment so as to form circular-shaped cutting edges, the type of work done being shown by the cutters *A* on the table of the machine. The same device is used for forming perfect radii on lathe tools and radius gages, these being clamped to the yoke *B*.

Referring to the sketch, *C* is a base bolted rigidly to the table of the cutter grinding machine and carrying a vertical rod *D*, which in turn carries the arms *E* and *F*. The outer ends of these arms carry center pins *G*, which fit in countersunk holes at the ends of the yoke *B*, thus enabling the yoke to be swung about a vertical axis through an angle of over 180 deg.

Yoke *B* carries the slotted bar *H*, which is fitted with the thread pin or stud *I* at the end toward the wheel. The cutter to be ground *J* is slipped on the pin *I* and held in place by a collar fitted with a setscrew, this being hidden by the cutter in the illustration. Spring stop *K*, which is secured to the lower end of the yoke, serves to hold the work in position while the teeth are being ground, and its height is so adjusted that the cutting edge of the tooth to be ground is level with the center of pin *I*. The cutter *J* is adjusted so that an imaginary line through the centers *G* intersects the center line of the teeth, the stud *I* being screwed in *H* to give the desired position and then locked by means of the locknut shown. The bar *H* is moved forward so as to make the distance from the cutting edge of the tooth to the line connecting the centers *G* equal to the radius it is desired to grind. When the cutting edge of *J* is in advance of the line through the centers *G*, a convex tooth is formed; but when it is behind, the tooth form is concave.

The grinding-machine table is dropped as low as is allowable with the proper clearance at the cutter, the carriage is advanced to where the cutter just comes in contact with the grinding wheel, and the limit stop *L* on the grinding carriage is set to this position. The



ATTACHMENT FOR GRINDING CIRCULAR-FORMED TEETH ON MILLING CUTTERS

work is lined up so as to be central with the wheel by means of the cross-feed screw of the grinding machine. The yoke *B* is swung while the wheel and the tooth are in contact, thus grinding the circular form. The carriage is then drawn back, the next tooth of the cutter shifted into position for grinding, the carriage advanced to the stop and the grinding operation repeated. A rubber-bonded grinding wheel of 8 in. diameter and ¼ in. thickness is used for this work.

A Non-Blotting Triangle

BY RICHARD J. JACKER

Any triangle may be beveled at the edges as shown in the illustration so that the ink from the drawing pen will not blot the paper. Besides preventing this trouble, such a triangle will glide easily over the heads of thumb tacks.

A NON-BLOTTING TRIANGLE

The Employees' Magazine and Safety First

By JOHN T. BARTLETT

"YOU know," narrated the employees' magazine editor, "Bill Ironsides is not what anyone would call a roughneck, but the fur on his neck sure showed points when he blew into our office a day or two after the last issue of our magazine was published.

"We only had to cast our lamps on the Safety Engineer for a moment to absorb the information that he was about to deliver himself of something.

"It came! He exploded! 'What d'yu mean by missing out on one of the most important departments of the yard in your new paper?' he hurled at us. 'You have a good magazine, and some good stuff in it, but you never said a blessed word (and that wasn't the word he used, either) about the safety-first branch of the yard's work, when you know that there are men in this yard, who practically refuse to take any precautions either as to their own or their fellow workmen's safety. We can't lose any opportunity of shooting Safety First into these guys!' "

When we suggested a Safety-First page for this number, Friend Ironsides subsided.

The commonest mistake in handling safety first and other material of an inspirational nature is to use altogether too much of it. One little story of two hundred words in an issue, containing ingredients of human interest which will arouse the reader and obtain a healthy mental reaction, is a thousand times better than 4.000 words, done in "hot air," space-filling manner.

The first thing to realize in connection with employees' magazine technique is that space alone is no device to obtain results. The magazine editor who heeds this knows a lot. He isn't going to clip long articles, run them, and hope they will accomplish results. He isn't going to editorialize vapidly in "hot air" fashion. He will use little safety-first material, relatively, but what he does use will be most carefully chosen and effectively presented. And he will plan to have some of it in every issue.

Giving the Personal Twist to Safety First

In the employees' magazine of one of our leading railroads, the successful editor, Robert M. Van Sant, finds monthly room for a "Safety Roll of Honor." This is not a mere list of names. In brief paragraphs, men who have done things to prevent accidents are commended. The act itself is tersely, but in detail, described. Each one of these stories is a thumbnail story, right out of life. It is safety first material of the very highest order.

The paragraphs are like these:

"On the morning of July 3, Signal Maintainer Carter, while working on his post, noticed two small children walking on westbound freight track while eastbound freight was passing. At the same time a westbound train was coming around a curve only a few hundred yards away. He quickly realized their danger, and started on a fast run just in time to reach them. Commendation is due Mr. Carter for saving these children from injury or possible death."

"What might have been a severe accident was prevented by the close observation of Leverman H. B. Hall, when he noticed brake rigging dragging under extra east 2699 while passing Carroll's. Crew was notified, train stopped, and obstruction removed. For his carefulness he has been commended by Superintendent Hoskins."

On this Safety Roll, mention is also made for acts of a somewhat different sort. For example:

"On September 10, Agent C. S. Mitchell at Flora shipped the storekeeper at Washington, Indiana, two kegs of old nails pulled from merchandise cars at his station. This not only saves that many nails but prevents a great deal of damage to freight from nails protruding and tearing sacks, etc. Mr. Mitchell is to be commended for his interest in making every saving possible. This is only one of his ways of saving money for the company."

Mention of this sort always pleases the person who was careful, strengthening his favorable feeling toward the safety idea.

Safety first material with a personal twist is safety first material par excellence. The Safety Roll of Honor is one ingenious, appealing use of the personal twist, and one of the very best. However, the clever employees' magazine editor finds individual, successful ways of his own.

This is one good way, oftentimes, to test the editor's size-up of his job. Let him decide to run a photograph of the physician the company employs for first aid. See how he does it.

Introducing the Company Doctor

If he is satisfied with a conventional, formal head of the physician, posed in his best professional manner, and if he runs this photograph with a caption like this, "James Towns, M. D., Company Physician," we can hazard an observation without any additional data. This employees' magazine editor still has something to learn about reaching workmen through the printed page.

In connection with its safety first work, a concern employing several thousand men naturally required the co-operation of the employees' magazine editor. The company maintained first-aid rooms, in charge of a competent physician. A photograph of this personage was in order.

The editor did it in this fashion. He got a snapshot of the doctor, standing within the works. The doctor had his pipe in one hand and his soft hat in the other. His fountain pen clip stuck out on his coat as big as life. The editor had a fine cut made of this snapshot, and ran it with the caption, "Doc. Hulse."

Then to go with it, he wrote a little story, headed in big type, "He's Your Friend." The story ran along something like this:

"This plant has a most enviable record as far as accidents go. For the size of the plant, and the number of the employees, the number of accidents that occur month by month is almost negligible. Our record is superior to any other industry in the state, and the chief of the hospital staff is anxious that we continue our good work, and keep our good name untarnished.

"He urges every man in the yard to take the greatest care of his own body, and to see to it that he does his share toward avoiding any possibility of accident.

"However, in even the best of regulated works, accidents do happen, but the injury from them can be minimized greatly if one simple rule is strictly adhered to by every employee.

"That is to report every accident, no matter how small it may appear, and to report it at once. Small bruises have turned into bad sores through delay in having them attended to. Lives have often been lost through neglect of a minor hurt.

"So remember this. The moment you are hurt, hike straight for the first aid rooms, and have Doc Hulse fix it up."

This was good safety first material. The familiar snapshot of "Doc Hulse" gave it a compelling personal twist. The photograph portrayed him a human sort of fellow, and helped to make employees feel acquainted with him. It helped to overcome the diffidence about going to first-aid rooms about a minor hurt which some men in overalls might feel. Informal, good photographs are always effective in lending interest and "punch" to safety first material in the employees' magazine.

The reference to the plant's safety record was a good touch. It appealed to shop pride. The language was informal about a matter which the company was anxious to shear of formality and ceremony. "hike" was exactly the right word to use. When a hurt was involved employees were urged not to "stand on ceremony," and the editor appropriately did not stand on ceremony himself in picking his words.

It is pertinent to remark, incidentally, that the employees' magazine is a publication in which "standing on ceremony" ought to be strictly taboo. I do not mean by this that it is necessary to use coarse language, or to make offenses against common good taste. But the flavor of the publication ought to be a familiar, sleeves-rolled-up, smiling kind. It ought to be a man-to-man, we're all-human publication. Such a publication will thereby be more readable, and thereby more fun to edit. The more important result is that the employees' magazine edited thus is going to be, by the same token, measurably more effective, whether handling safety first material or any other.

Short Stuff in Plant Publication Is Itself Safety First

Workingmen have not had practice on "dry stuff" in college or elsewhere, as some of the rest of us have, and their powers of concentration when the printed message is involved demand lively, easy-to-read matter. Otherwise they probably won't read it at all.

Bill Ironsides said:

"Always give SAFETY the first consideration.

"Warn a man when danger is near; you may save him from injury.

"If you remove a safety device for repair work, replace the guard when the job is done.

"A preventable accident is a disgrace to the foreman in whose gang it happened.

"Beware of blood poisoning; a scratch may cause it.

"Do not pile material so that there is danger of it falling; you may be the man hurt when it falls.

"Don't join the blind man's club—wear your goggles.

"To be careless, thoughtless or reckless, means injury sooner or later to yourself or others.

"Remember safety first, last and all the time; this slogan has delayed the cost of many a tombstone."

Lengthy stuff, taking on the character of unvarnished "hot air," to use an inelegant term for something which is far from elegant itself, is one error in handling safety first material in employees' magazines. Even when the articles are well done, length frequently will destroy much of the effectiveness.

Another error is in tone. "Talking down" and an abusive attitude toward prevalent wrong practices, either don't accomplish the object sought or accomplish it at the cost of ill-will.

An editor who has the viewpoint of the men, who has a warm, human, man-to-man way of handling editorial matter will contribute to the upbuilding of safety first morale among the men. His material, in many cases, will be brief, pithy, full of fire. He will usually find the personal twist, obtained in one fashion or another, the most important device to make his safety first stories readable and effective.

Using Blanked Plates for Trimmer Dies

By H. W. Armstrong

The man who has a drop-forging plant connected with his factory, and who has to pay the bills, knows what a large item of expense is the making and repairing of trimmer dies and punches.

The usual way to make the trimmer die is to take a block of tool steel and lay out, drill or mill, and then file the interior so as to trim the flash from the forging. The dies are made solid in some cases and in other cases are made in two or more sections which are fitted together to form a complete die.

In the shop with which I am connected, we make a large number of dies of the same design to trim small forgings. Our practice in the past has been to make these dies from a solid block of tool steel weighing about six pounds and made so as to trim two forgings at once, the forgings being strung out under the hammer and the entire string being taken, while still hot, to the trimming press and trimmed by another workman.

The writer conceived the idea of making certain changes in the construction of these dies and punches which may be of interest to others in similar lines. The savings in labor and material in a plant making thousands of small forgings may easily reach thousands of dollars in a year's time. The first thing we did was to make a plate, as shown in Fig. 1, of tool

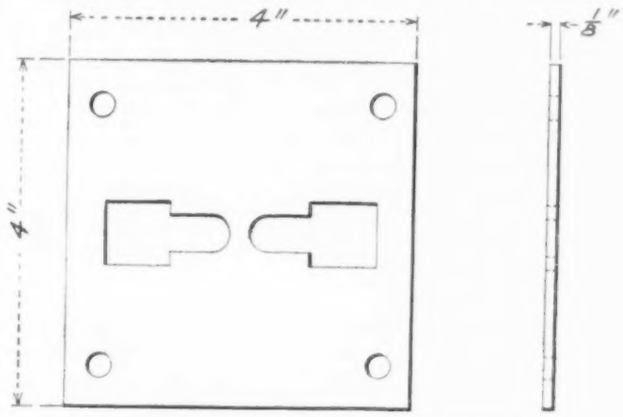


FIG. 1. PLATE FOR FACE OF TRIMMING DIE

steel ¼ in. thick and of the same dimensions as on trimmer dies. Then we took a soft-steel base and fastened the plate to it by means of four screws, and milled and filed the stock out in the base so as to let the forging drop through after trimming, the same as in the regular die. After hardening the plate and attaching it to the base we used it as a trimming die and when worn out threw it in the scrap and attached another plate. Finding that the plates worked quite as well as a solid tool-steel die, we next made a punch and die and punched out a number of such plates. These plates were filed for clearance and then hardened. Instead of removing a die from the bolster when the plate is worn out we simply unscrew the plate and substituate another, which takes about three minutes.

A still further reduction in cost was made by substituting cold-rolled steel for tool steel and hardening in cyanide. We have not been able to get any two plates to run exactly alike, the poorest trimming about 1,200 forgings and the best ones trimming about 7,200 forgings. A fair average would be about 3,000 forgings—1,500 on each side of the die. Anyone who has had any experience with trimmer dies will see what a great saving we have effected. I will quote some figures from our own comparison of costs:

Cost of solid dies, labor, steel, overhead, etc.	$17.50
Cost of reworking five times	12.50
Total cost	$30.00

The reworking, of course, consists of annealing the worn die, peening in the stock while red hot and, afterward, filing and rehardening. After this has been done about five times the die is scrapped.

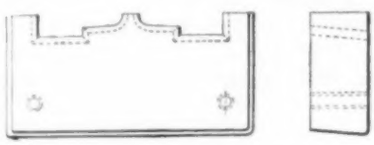


FIG. 2. BLOCK FOR TRIMMING DIE

The cost of the cold-rolled stamped plate is about eight cents, which includes labor and material. However, we use six of these while we are using one solid die six times, the cost of the plates being forty-eight cents.

The base or plate holder if made of soft steel, case-hardened, costs about $5 and will last indefinitely. This is made in two pieces as it is much easier to make. See Fig. 2. It will be noted from the figures that we have over $29 on each die and as we used to make 200 per year the saving on the dies alone will amount to nearly $6,000 per year. We are now having some cast-iron holders made with the clearance cored in and will try these instead of the steel holders. We are unable to state at present how this will work out.

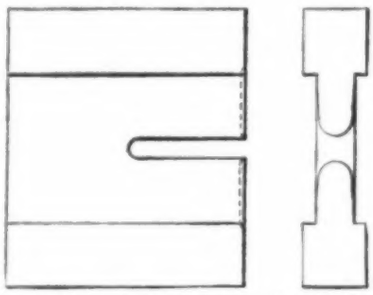


FIG. 3. TOOL-STEEL TRIMMING PUNCH

The punches were originally made of tool steel and shaped as shown in Fig. 3. They were planed in a long bar, then cut to length and milled out in the center and on the ends. Then they were fitted to the die and hardened.

The cost of the punches was as follows:

Labor, material, etc.	$ 7.50
Reworking five times	10.00
Total cost	$17.50

We then made the punches of malleable iron and after finishing on the ends they were ready for use at a cost of about eight cents each. These were reworked five times at a cost of about $2, making the total cost during the life of the punch about $2.80.

Difference in cost, $17.50 — $2.80, or $14.70

However, one trouble was that the iron punch wears rapidly; and we are now using a hardened-steel piece attached to the end of the punch as shown in Fig. 4. We expect this to reduce our cost still further, but at present have no figures to present.

The great difference in the reworking cost of punches is due to the fact that the steel punch had to be annealed, hammered out, filed and rehardened every time it was reworked, while we just milled the end of the iron punch over again. However, the iron punch does not last as long as the steel one but with the addition of the steel end will probably last much longer, as only the steel end will have to be renewed, the iron body of the punch lasting indefinitely.

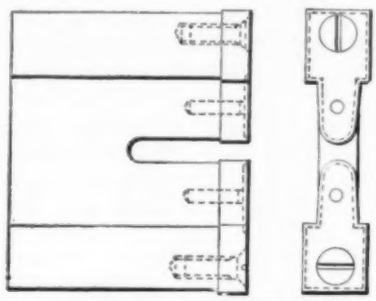


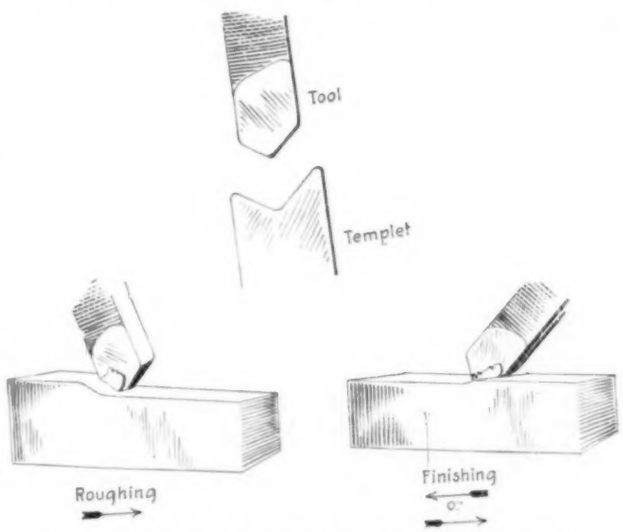
FIG. 4. TRIMMING PUNCH FACED WITH HARDENED-STEEL PLATE

Of course, it must be admitted that it is not practicable for anyone to use this system on all kinds of forging work, but for a shop which makes small forgings in large quantities it will be well worth trying. I would suggest that a plate and base be made and tried out thoroughly on the work before going to the expense of making punches and dies to make the plates in large quantities.

A Shaper Kink

BY CHARLES D. FOLSOM, JR.

When there is a considerable number of small castings over which one or more rough cuts and one finish cut must be taken, time may be saved by grinding the tool as shown in the sketch so that it may be used for both cuts. On the rough cut throw the clapper-box over to the left as shown. When finishing, throw it over to the right, using the drag or flat on the following edge of the tool. If care is taken to bring the clapper firmly against the clamping screw before tightening, the tool will obviously come to the same position each time. Hence, after a few trials, you can set the micrometer dial so that the roughing cut will leave just enough to finish, and the finishing cut will bring the work to size quite uniformly. It is advisable to make a little templet as at *A* for the tool, to avoid experimenting the next time it has to be ground.



ROUGHING AND FINISHING TOOL FOR SHAPER

Machining the Liberty Crankcase—II.

By H. A. CARHART,
Lincoln Motor Co., Detroit, Mich.

This shows the interesting method used in drilling the holes for the oil tubes. The crankcase is a "dry" type, instead of splash oiling as in general automobile practice. The final reaming of the bearings is a particular job and is of special interest.

(*Part I was published in our June 10 issue.*)

THE design of the Liberty motor includes what is known as a dry crankcase, which means that the oil for lubrication is carried in oil pipes directly to the different bearings, instead of depending upon or in any way utilizing the splash oiling so common in automobile practice. These oil pipes run along the bottom of the lower half of the crankcase, and as they must pass through the various partitions it is necessary that the hole be drilled for them and that this hole be of the correct diameter and in line from end to end. The fixture for drilling these holes, which vary from $\frac{31}{64}$ to $\frac{33}{64}$ in., is shown in Fig. 16. The fixture consists of a revolving bar stand having seven suitably-arranged extension arms to which the case is clamped, and each of these arms has guide bushings for the drill.

The revolving stand is pivoted at both ends, as can be seen, and the drills used are shown in the conveniently placed rack at the left. The lower end of the stand has an indexing plate operated by a foot trip. Seven different drills are used, the first hole being drilled by the shortest drill *A*; the longest drill is in place in the machine. Both the holes in the first partition are drilled with the $\frac{31}{64}$-in. drill, the work being indexed from one position to the other. After this, however, each hole is drilled separately, as it would be necessary to remove the drill in either case.

The length of each drill is arranged to take the various partitions so as to be correctly guided and insure the holes being in line. Each drill is provided with a guiding surface just behind the cutting edge. After drilling, these holes are reamed with a series of seven reamers. The oil tubes are afterward driven in, using a special driving tool consisting of a knurled bar having a small pilot at the end which enters the tube and holds the driver in position. The two oil tubes are inserted as far as they will go and are driven into place with a 2½-lb. machinist's hammer. About twenty-five cases can be tubed in an hour by a good operator.

Fig. 17 shows a special drilling head for drilling holes which hold the bail for the pump cover. The details of this special drilling head are shown in Fig. 18. The small horizontal drills are driven by the large bevel

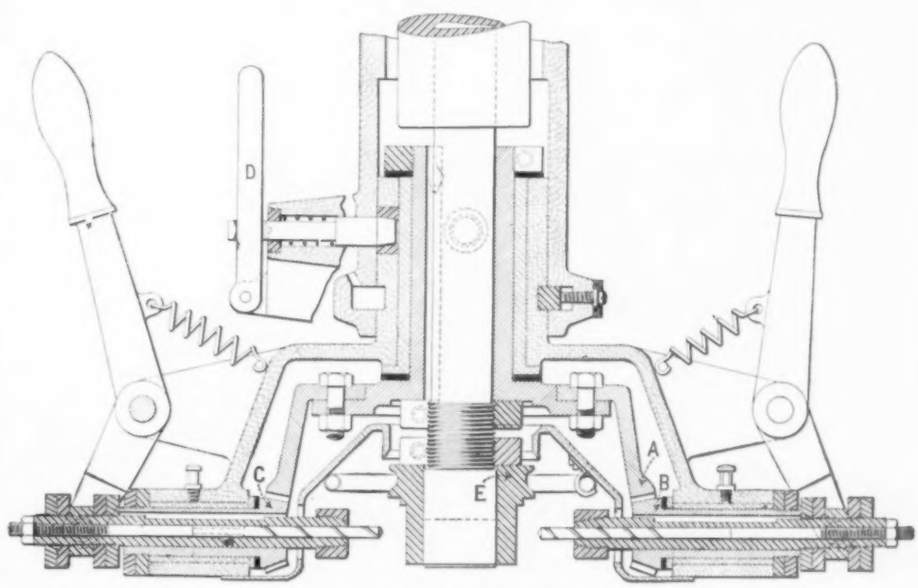


FIG. 18. DETAILS OF DRILLING HEAD

AUTOMOTIVE CONSTRUCTION

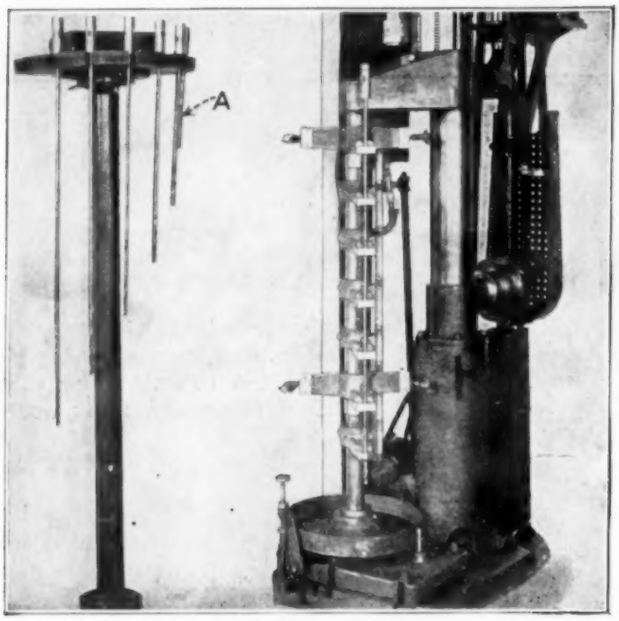


FIG. 16. DRILLING FOR OIL PIPES

gear *A*, which drives the pinions *B* and *C*. Each drill is fed independently by its handle, the springs returning the handle to normal position. The whole head can be indexed by means of the handle *D*.

The drills run 900 r.p.m. and can drill about 500 cases between grindings. The pilot *E* centers the drilling head with the part to be drilled, and also locates the holes at the proper distance from the end.

An application of the continuous track is shown in Fig. 19, where two three-spindle drills are used for counterboring and rough-tapping the stud holes in the oil-pump pad. The carriage in this case is also of aluminum, being mounted on a subcarriage, so that while the aluminum carriage moves crosswise of the rails, the subcarriage moves it from machine to machine, and in this way gives a full floating movement so as to locate the holes in any desired position. The drills approximate $\frac{1}{2}$ in. in diameter and run at 900 r.p.m. The drills and counterbores will handle 100 cases between grinding and the taps must be renewed at about the same time.

After inspection and, if necessary, the final lapping of the joint surfaces to insure perfect contact the whole length, the upper and lower half are bolted together and the main bearing reamed on the fixture shown in Fig. 20. This fixture is mounted on a lathe carriage from which the tool block has been removed. It consists of a bedplate having the two substantial end pedestals shown and the fixed posts which fit the cylinder holes and carry hardened bushings for guiding the reamer. There are six sliding shoes operated by the cross-handles shown, these sliding shoes supporting the case in its proper position. There are also two sliding wedges at the rear which bear against the angular face. After the crankcase has been placed correctly, six hooks, operated by the six long handles shown, hold the case rigidly in place during the reaming operation.

WASHING OUT THE CHIPS

The bar carrying the reamer is hollow, and lubricant is pumped through it to wash the chips from the cutting edges of the reamer. Great care is taken in locating the case, a dial indicator being used which shows at once if the case is being sprung by the adjustment of the wedges. The reamer is 2.955 in. in diameter, has a land $\frac{1}{16}$ in. wide and a lead of $\frac{3}{8}$ in. The reamer increases the hole 0.01 in. and allows 0.005 in. for finish by the Martell system. The main-bearing bore is held to a limit of 0.002 in., the reamers maintaining their size for about ten cases. The speed is 200 r.p.m. and the feed 0.07 in. At this rate the machine handles about ten cases per hour.

The final reaming is shown in Fig. 21, the equipment consisting of a tubular stand for the motor and driving unit, and a stand of angle iron for holding the crankcase. A 2-hp. motor is used, driving through an inclosed worm and an Oldham joint. The feed is by the handwheel *A* through the reduction gears shown. A quick return is also provided. A lining bar is first placed in position, after which the eccentric bushings are inserted and everything lined up in accordance with the Martell system. After the bushings are lined up, the bar is pulled out sufficiently to allow the Martell reamers to be slipped over the bearings Nos. 5, 6 and 7, and the bar partly removed in the opposite direction, so that the remaining reamers can be put in place.

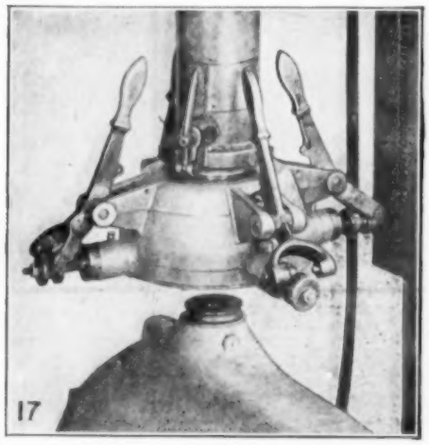


FIG. 17. SPECIAL DRILLING HEAD

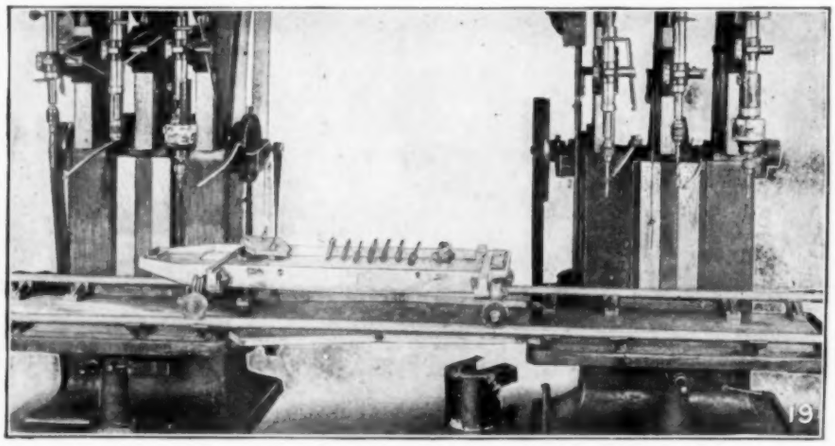


FIG. 19. USING AN ALUMINUM CARRIAGE

AUTOMOTIVE CONSTRUCTION

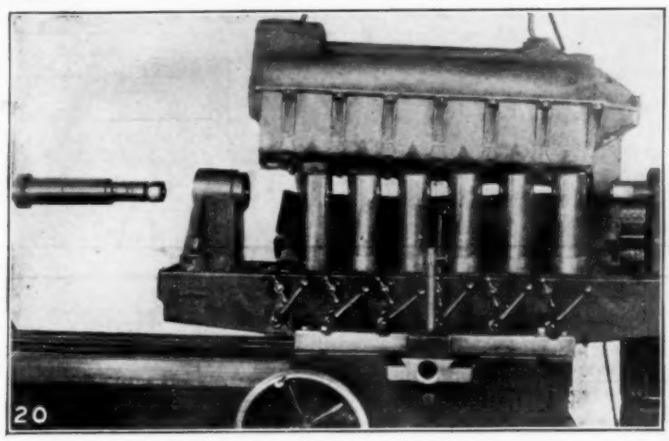


FIG. 20. REAMING MAIN BEARING

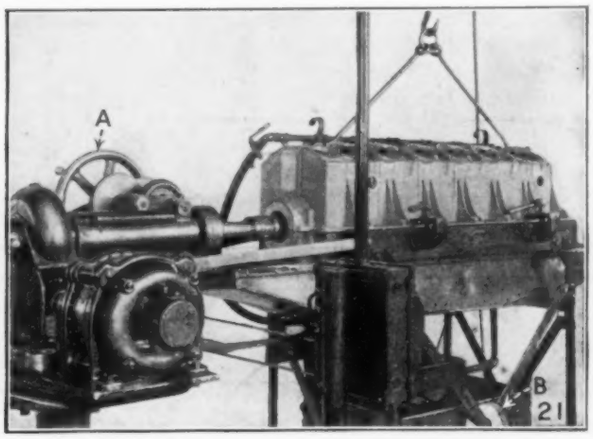


FIG. 21. THE FINAL REAMING

This is done before the case is lifted to the stand by means of the grapple hooks shown. The U-shaped pieces of sheet steel shown at *B* are placed on both sides of the reamers, which ream bearings Nos. 4 and 6, and on the front side of the reamers that ream bearings Nos. 2, 3 and 5. The reamer for No. 7 is placed in its proper driving notch of the lining bar, and this bearing partly reamed because it is considerably longer than the others. During the preliminary reaming operation the other reamers are prevented from entering the bearings by means of the sheet-steel pieces mentioned. The motor is then stopped, the U-shaped pieces removed, and the six other reamers placed in their proper driving notches, after which all of the bearings are reamed.

As soon as the front cutting edges of the reamers have passed through their bearings, the motor is stopped and the reamers are shoved through by means of the hand feed screw. This precaution was found to be necessary on account of the weight of the bar and reamers, as, when they are allowed to revolve after the front cutting edge has passed through the bearings, they will drag and make the bearings elliptical in shape. The reamers are 3 in. in diameter, backed off to $\frac{1}{32}$-in. land with a $\frac{3}{4}$-in. lead. They must be adjusted every fourth or fifth case and must be ground every twenty cases, while occasional stoning in between grindings is sometimes necessary.

The amount of stock removed is approximately 0.005 in. on the diameter. The reamers turn at the rate of 40 r.p.m., and the hand feed is about 0.1 in. per revolution. This equipment handles five cases per hour. The lubricant is a half-and-half mixture of thread-cutting oil and kerosene, which is distributed by means of a pump through tubing to each reamer from above and returning through a drain to a tank below.

Finishing the Thrust Bearing

An interesting fixture for finishing the thrust bearing to its proper width is shown in Fig. 22. This fixture is also mounted on a lathe carriage and has two uprights, the forward at *A* fitting the cylinder bore, and the other at *B* supporting the lining bar outside the case. The bar is removed, the crankcase lowered over the pilot, lined up by inserting the bar through all the bearings, and is then securely held by the clamps shown. The carriage is moved toward the faceplate and is located by the indicator shown.

The carriage is then clamped in the proper position, the machine started, and the cutter fed in by means of the star wheel to the proper depth. The machine is then

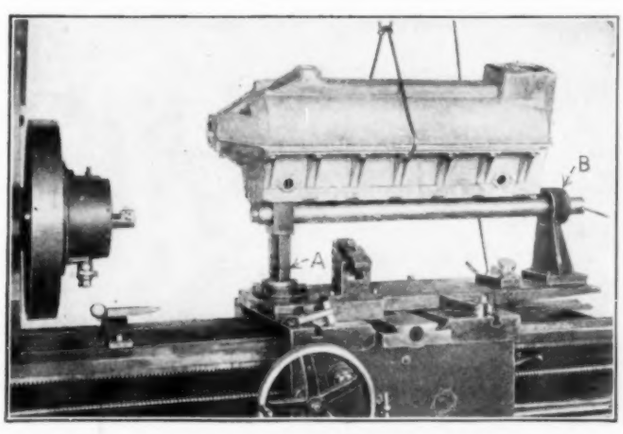


FIG. 22. FINISHING THRUST BEARING

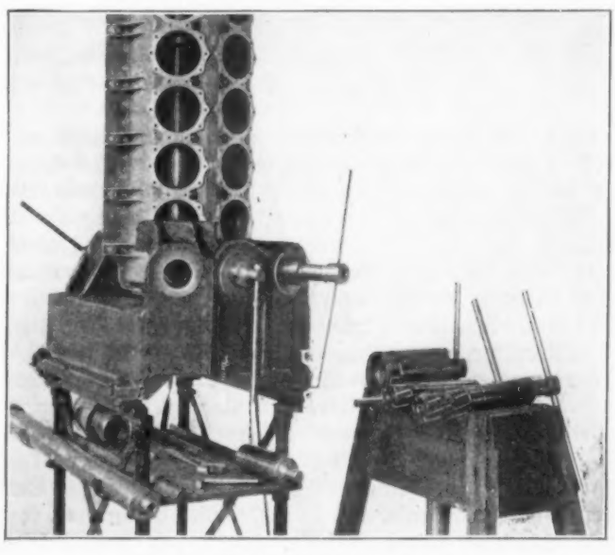


FIG. 23. HAND-REAMING FIXTURE

AUTOMOTIVE CONSTRUCTION

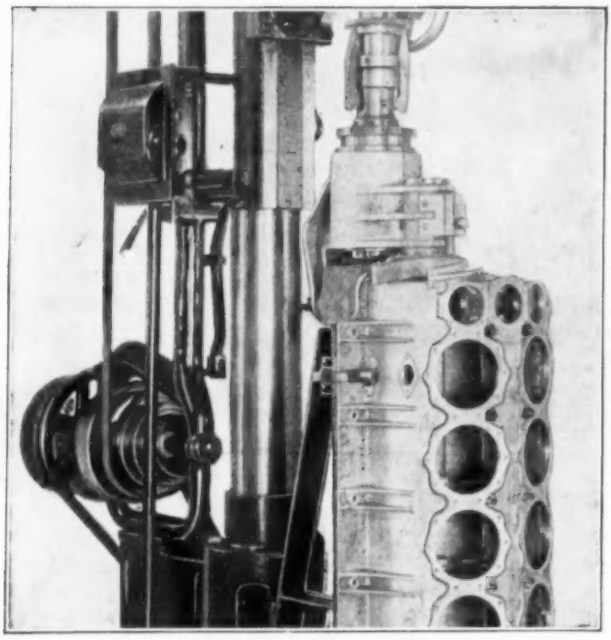


FIG. 24. A LIFTING ATTACHMENT

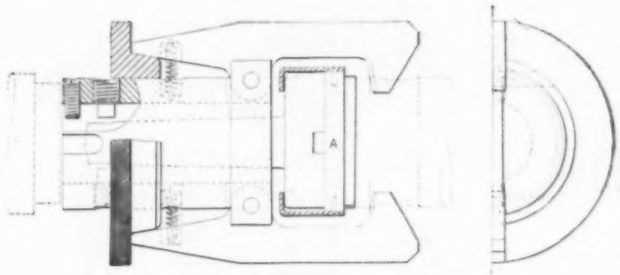


FIG. 25. DETAILS OF THE LIFTER

ing and 0.005 in. for finishing. All reamers are ground with about 0.0005 in. back taper and backed off to a land of $\frac{1}{64}$ in. with a $\frac{3}{8}$-in. lead. They handle between seventy-five and a hundred cases between grindings. A half-and-half mixture of thread-cutting oil and kerosene, applied from an oil can, is used as a lubricant.

LIFTING THE CRANKCASE

An unusual lifting and driving attachment is shown in Fig. 24, and in detail in Fig. 25. This is for reaming and facing the hole at the end of the crankcase, a combination tool being used for this purpose. The clamps

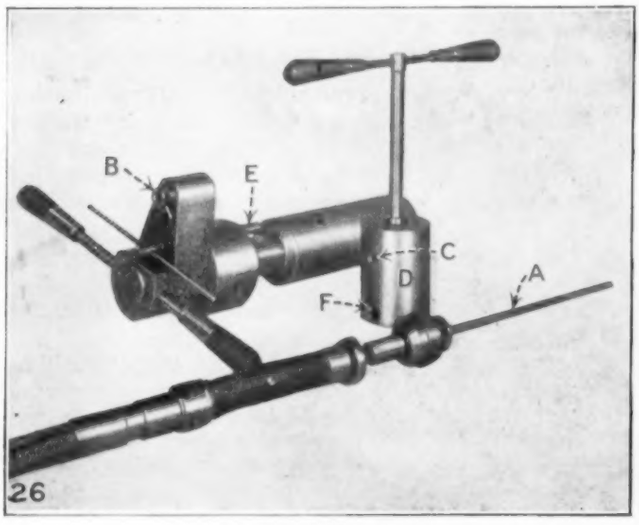


FIG. 26. A REAMING FIXTURE

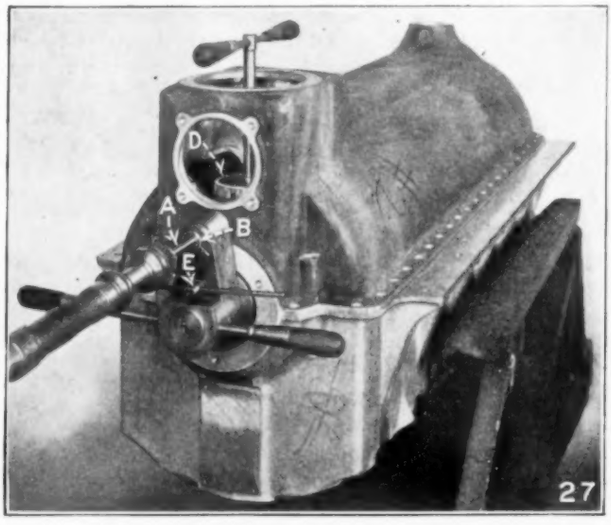


FIG. 27. REAMING FIXTURE IN PLACE

stopped, the cutter backed out, and the carriage run back in the usual manner. In order to have the operator handle the star wheel easily it was found desirable to limit the speed to 40 r.p.m., the feed being about 0.012 in. per revolution. By using a high-speed steel cutter with very little clearance it can be stoned on the front to some extent and will keep its size for about 100 cases. About 0.02 in. stock is removed on each side by this cutter, no lubricant being used.

A convenient hand-reaming fixture for finishing the holes for the camshaft drive and also the generator is shown in Fig. 23. It requires practically no description. The reamers are all of the hollow body type for convenience in handling, the bodies being hardened and ground on the outside, and 24-in. handles being used for turning. The camshaft holes are rough and finish-reamed in this fixture, 0.01 in. being allowed for rough-

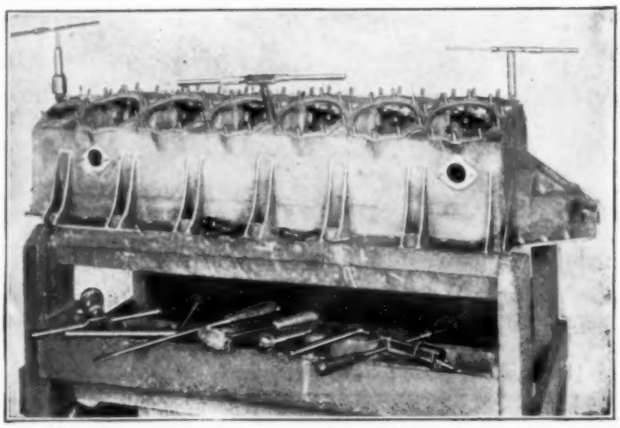


FIG. 28. BENCH AND TOOLS FOR STUDDING

AUTOMOTIVE CONSTRUCTION

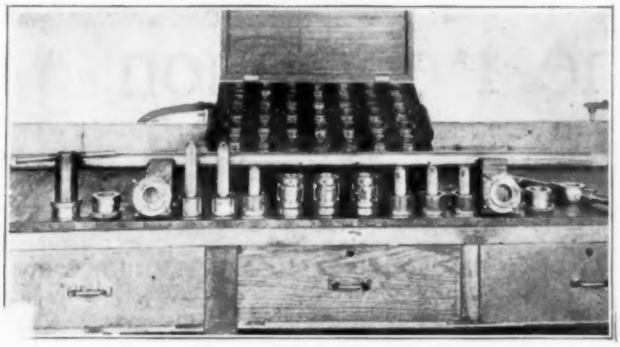


FIG. 29. THE FINISHING REAMERS

shown lift the crankcase into position. After lifting the crankcase into position, the reaming and facing tool is put in position and is driven by the Oldham coupling shown at *A*.

An Interesting Finish-Reaming Fixture

An interesting fixture for finish-reaming the lock-screw holes for the bevel-gear bearings is shown in Figs. 26 and 27. The first shows the different parts of this combination in approximately their correct position, while Fig. 27 shows them in place in the crankcase. It will be noted that the reamer *A*, which is driven by a flexible shaft, is guided by both the bushings *B* and *C*. In order to insure that these are in the correct position the guide plug *D* is located with respect to the other bushing by the pin *E*, which fits into the lower hole *F*. The roughing reamer uses thread-cutting oil and kerosene, but it has been found best to run the finishing reamer dry.

There remains only drilling, counterboring, and reaming various dowel and similar holes, after which a third assembly inspection is given, which is thorough and involves many details. Seven inspectors average an inspection of about fifty-five cases per day. Then the various studs are put in place, after which all the protruding ends are gone over with a hand die to remove burrs.

The oil manifold holes are retapped and the burrs removed from the edges of all reamed holes. This requires about three hours per case for one man.

Studding the Crankcase

Next comes the studding of the crankcase. The tools for this work are kept in kit boxes, which include all that is necessary, the studding bench and tools being shown in Fig. 28. The cases are then thoroughly washed, after which they are ready to receive the main bearing. When these are finally in place they are finish-reamed with a set of Martell reamers, as shown in Fig. 29. This outfit includes thirty-five reamers. Each bearing is reamed 0.0025 in. larger than the recorded diameter of the crankshaft which is to go in it, so that each bearing is reamed for the particular shaft bearing which it is to carry.

A completed lower half of the crankcase, with the water pump in position on the end, and the oil pump at the bottom, is shown in Fig. 30.

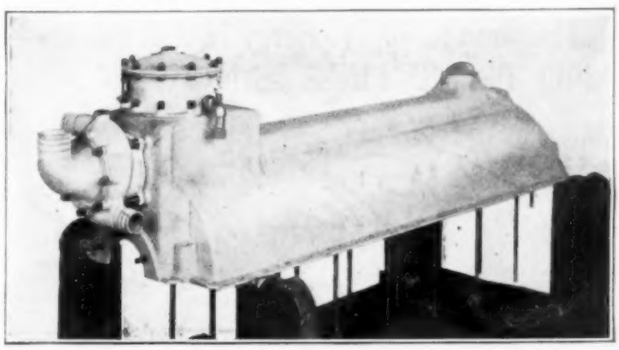


FIG. 30. THE COMPLETED LOWER HALF

How to Keep Employees on the Job in Summer Time

By Frank H. Williams

The problem of keeping all, or at least a goodly percentage of employees, on the job during the summer time, is a problem which has become of especial importance at this time of the year. Too frequently the Saturday half-holiday becomes an all-day holiday during the summer months, whether it is due to "sickness in the family" or to the old-time office-boy alibi of "burying a grandmother," or to any other cause which may be based entirely upon fact—or not.

How can the plant employing large numbers of workmen keep attendance of employees at pretty nearly 100 per cent during the summer time when every man feels the lure of nearby lakes, or ball games, or a trip through the countryside in his own flivver or the auto of a friend?

One method by which greater efficiency in this particular can be attained is through the use of a bonus.

The Edison Lamp works, Fort Wayne, Indiana, one of the plants of the General Electric Co., used a bonus with good effect last year and has anounced that the same plan will be inaugurated this year on June 14, continuing in effect until Sept. 11. Under this plan the factory will give a bonus amounting to about one week's wages to employees who have a perfect attendance during this period. The period includes sixty-two full working days and excludes the shut-down of a week for the summer vacation and the other holidays which will occur during the summer. The exact bonus is 10 per cent of the employees' earnings during the period to those who miss no time. The payments will be additional to regular bonuses. No bonus will be given those losing more than a week's time. All factory employees will be entitled to the bonus, while the office employees, foremen, assistant foremen, leaders, machinists, gatemen, watchmen and other persons not connected with the factory work will not be granted the extra money.

Isn't this plan about the most effective that can be evolved, in the long run? And isn't it, too, about the cheapest in the end?

Certainly, nothing much appeals to employees in a case of this kind as does money. If they can see where they are going to be a worth while sum of money ahead by sticking on the job it is quite probable that they will stick, no matter how strongly the call of the outdoors may be sounding in their ears.

The Spirit of the Federation

ONE of our editors recently sent in this item: "The Technical Club of Madison, Wis., held its first regular meeting June 7, 1920. This club, with a membership of 175, was organized for the promotion of good fellowship and spirit, with *special regard to the part the engineers can take in public affairs.*"

* * *

This is a 175-caliber gun set and ready for action in the great forward movement for engineering recognition. It, like all other such units, should take its place in the battery of the Federated American Engineering Societies.

Only by united action through such a group as the Federation can results befitting engineers be obtained.

* * *

Special attention is called to the following extracts from the Federation constitution, which was published in full in our last issue:

ART. II. OBJECT

"Service to others is the expression of the highest motive to which men can respond, and duty to contribute to the public welfare demands the best efforts that men can put forth; therefore, it shall be the object of this organization to further the interests of the public through the use of technical knowledge and engineering experience, and to consider and act upon matters common to the engineering and allied technical professions."

ART. VII. LOCAL AFFILIATIONS

"Sec. 1. Object. The American Engineering Council shall encourage the formation of local affiliations, to consider matters of local public welfare with which the engineering and allied technical professions are concerned, as well as other matters of common interest to these professions, in order that there may be united action and that suggestions and advice may be offered to the Council."

* * *

There is absolutely nothing in the object of the Federation that cannot be subscribed to with a clear conscience by every real engineer member of every organization eligible for membership.

Every engineer in the country should boost for the Federation and its object, and back to the limit his local organization for membership in the National body.

The time to apply energy is at the start—AND THAT TIME IS NOW.

Thos. Viall

Editor

(Inquiries regarding the Federation of American Engineers may be sent temporarily to the American Society of Mechanical Engineers, 29 West 39th St., New York City.)

Method of Hardening Long Small Wires

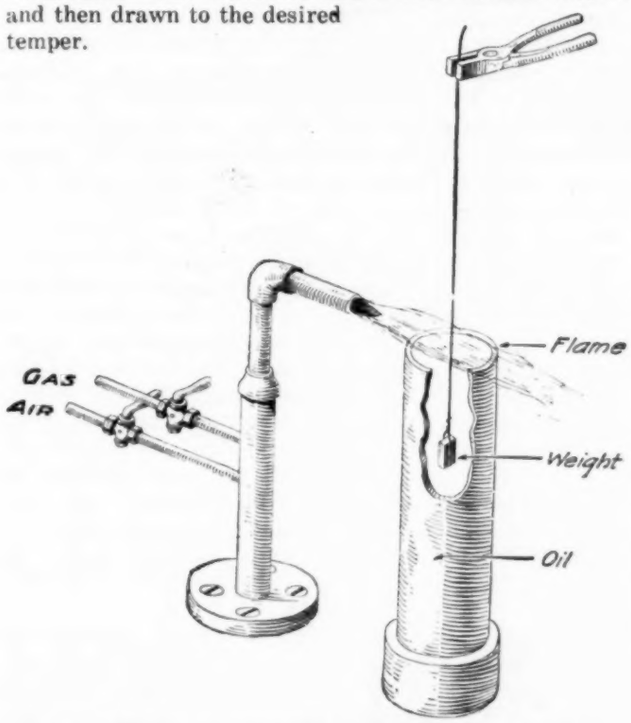
By Charles F. Stotz

A method of hardening long slender punches, which I have used with good results on punches 0.016 in. and 0.020 in. in diam. and about 1¾ in. long, is as follows:

The wires from which the punches are made are first cut to about 14 in. in length. It is necessary that a gas flame be available which will just pass across the top of a piece of 3- or 4-in. pipe 16 in. long, set on end and sealed at the bottom. The pipe is to be filled to the top with oil suitable for hardening. The arrangement is shown in the illustration.

Attach a small weight on one end of each wire and hold the other end with tongs. Raise the wire in a vertical position so that the weight will about touch the oil, then lower it slowly into the oil as fast as the flame heats the wire properly.

When the wire is submerged to its whole length the flame is shut off or diverted so that the wire may be withdrawn. The wires are cut to the required lengths and then drawn to the desired temper.

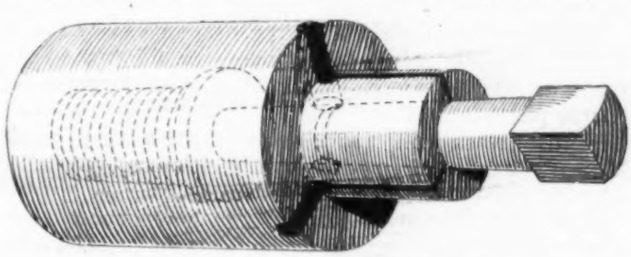


DEVICE FOR HARDENING LONG SMALL WIRES

A Simple Expanding Mandrel

By H. Kurzweil

In respect to the simple expanding mandrel described by E. A. Dixie on page 833, Vol. 51, I should consider it necessary, if the tool is to give satisfactory service, to



SIMPLE EXPANDING MANDREL

drill holes at the ends of the slots, as shown in the sketch herewith.

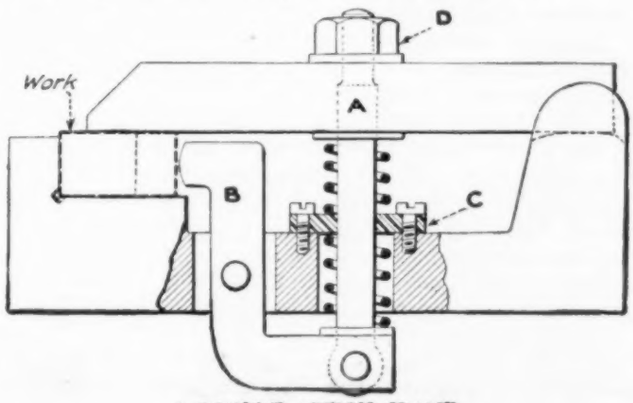
These holes will provide for the backspring of the leaves, not only giving a firmer grip on the work to be held, but also prolonging the life of the tool.

A Double-Action Clamp

By R. W. Belmont

A double action clamp that may be adapted to jigs and fixtures is shown in the illustration.

The stud *A* that tightens the clamp is pivoted to the lever *B*. Two coil springs supported by the plate *C* serve to throw the clamps open when the pressure is released. When the nut *D* is tightened the clamp is drawn down on top of the work at the same time that the latter is forced against the fixed jaw by the bent lever *B*.



A DOUBLE-ACTION CLAMP

EDITORIALS

The Value of High-Altitude Flying

MOST people—and this includes most editors as well—have looked upon Major Schroeder's high-altitude flying as "a fool stunt" of no practical value. Some conceded that to have an American hold the world's altitude record was good publicity, but that was about all.

However, very few know of the careful study and planning of the Air Service that preceded these flights, and the valuable data and conclusions that were the results.

The outcome of future wars—for we may as well face facts—will depend largely on the efficiency and knowledge of the Air Service. The higher an airplane can fly, the safer it will be from observation or destruction.

Early war planes had a ceiling around 5,000 ft., but this was rapidly raised by improved machines until in the later days of the war, 20,000 ft. was common for chasse planes.

Future wars will undoubtedly require very much higher altitudes than this, owing to improved anti-aircraft guns and other devices.

From this it will be readily seen how important is the study of high-altitude flying, and under such conditions as made by Major Schroeder it is not "stunt flying" but scientific research and deserves to be known as such.

In high-altitude flying, devices must be perfected to keep the aviators alive by furnishing them the necessary oxygen. Another problem is to increase the efficiency of the motor and the propeller, since the rarefied air rapidly lowers this efficiency as the machine rises above 5,000 ft.

To supply air to the motor at the proper pressure, a number of devices have been tried out. One which has proved very successful is known as the Moss Supercharger, and in conjunction with this a variable-pitch propeller has been used. A motor without a supercharger loses about 45 per cent of its sea-level power when operating at 15,000 ft.

A few of the difficult problems to be studied and solved may be outlined as follows:

How to keep the air and gas-mixture ratio of the carburetor constant at various altitudes.

How to properly deliver fuel to the carburetor against varying pressure.

How to cool at high altitudes and offset the rising boiling point of water.

How to provide a drain valve to let the water out of the radiator in case the motor stops, so as to prevent the freezing of the water in the cooling system, which would ruin it. This valve must be made so as not to freeze and become inoperative.

How to overcome pre-ignition, encountered when running with the supercharger in action.

These are merely samples of what the difficulties are. In Major Schroeder's great flight it appears that he suffered more from carbon-monoxide poisoning, due to unlooked-for expansion of exhaust gases, than from lack of oxygen.

Aside from the problems of the airplane itself, there are yet great unsolved problems of the upper air currents to be worked out. It is believed by some that above 40,000 ft. trade winds will be discovered that blow constantly from east to west, just as Major Schroeder apparently proved in his record flights around 30,000 ft., that there were winds blowing from west to east.

The settling of the air-current question alone will prove of enormous value in planning commercial or military movements.

From now on, let's give Major Schroeder and the Air Service credit for real scientific research efforts and not think of them as merely pulling off movie stunts.

E. V.

Countersigns and Jobs

AS WE look forward to Independence Day, now close at hand, let us think, and decide in our own minds how many of us are keeping to the basic principles of a true Republic.

In a REAL Republic, the will of a majority of the people is supreme! It was for this purpose our Republic was founded.

When the majority does not rule, the purpose is defeated and the Government—recognized or otherwise—becomes that of a dictatorship, whether the power rests in an individual or a minority organization.

Washington said in his farewell address:

"The very idea of the power and the right of the people to establish government presupposes the duty of every individual to obey the established Government. All obstructions to the execution of the laws, all combinations and associations, under whatever plausible character, with the real design to direct, control, counteract or awe the regular deliberation and action of the constituted authorities, are destructive to this fundamental principle, and of fatal tendency. They serve to organize faction, to give it an artificial and extraordinary force; to put, in the place of the delegated will of the nation, the will of a party, often a small but artful and enterprising minority of the community. . . . However combinations or associations of the above description may now and then answer popular ends, they are likely, in the course of time and things, to become potent engines, by which cunning, ambitious and unprincipled men will be enabled to subvert the power of the people and to usurp for themselves the reins of Government, destroying afterward the very engines which have lifted them to unjust dominion."

The principles of our Republic make it plain that the rights of one individual end where those of another begin.

The rights of ANY group, secular or political, are subordinate to those of the nation taken as a whole.

No group has the right to interfere with the welfare of the majority.

No organization, outlaw or otherwise, has a right to close the channels through which the majority—the people—obtain the necessaries of life.

No group or organization has the right to monopolize any branch of trade or industry to the exclusion of other unallied groups or individuals.

This applies equally to trusts, religious orders, lodges or unions.

It is neither right nor legal to say that only Baptists, or Catholics, or Jews, or Gentiles, or Masons, or Knights of Columbus, shall have a chance to earn an honest living in certain lines.

To say that these have not the right and the freedom to work side by side on ANY job, if they are otherwise qualified, is to preach tyranny and oppression.

Prevention of such free working conditions either by force, intimidation, or otherwise, is un-American, unjust and illegal.

Put it up to yourself: Do you believe it is right to compel a man or woman to give a specific countersign in order to work?

Do you believe that inability to give such a countersign should result in the starvation of the individual, or his persistence in working, result in starving thousands of American people by the tying up of traffic or by other means? E. V.

The Mechanics of the Future

Everyone agrees that there is a shortage of good mechanics and joins in the general lamentation that this is so. Many attribute different causes, these depending on the various viewpoints as to both political and labor matters.

Interesting as these opinions are, they are not going to remedy the situation as long as they remain mere explanations of why the conditions remain as they are. The industry and the country need more and better mechanics—what are they doing about it?

There is much talk of vocational schools, of Federal aid to schools by the Smith-Hughes Vocational Education Law and these all have their place. But no plan can succeed unless every machine builder does his share in the work. If he cannot train apprentices well, he may be able to assist some of these vocational or part-time schools. But every shop should do something which will count in this work.

One way of doing this is shown in the article on page 1335 which outlines what Henry Ford is doing in Detroit. This has the great advantage of giving the boy in the poorest of families an opportunity to learn a real trade, which is too often denied by a combination of circumstances over which he has no control. And equality of opportunity removes the fuse from many explosive arguments of the ultra-radicals.

Few manufacturers may be able to go into this as extensively or as liberally as this, but all can and should put a shoulder to the wheel. Each should ask himself, "Am I doing my share to train good mechanics for the greatest industry in the world?" F. H. C.

THE Reparations Commission has discovered that the German dye monopoly has been selling dye products to its own nationals at one-sixth the price it was charging the Commission. The latter, of course, has simply marked the credits down to the legitimate German price.

If it is possible for Germans to sell at home dyes at one-sixth of what seemed to the Reparations Commission at first a fair price, what tariff wall could possibly protect the American industry against German dumping?

The life of the American dye industry hangs on the enactment of legislation giving it complete protection.—*Manufacturers' Record.*

Why the Blueprint?

BY JOHN VINCENT

The article by Frank Richards on page 871 of the *American Machinist* is interesting reading, but he overlooked some essential features that would render absurd his photo-engraving process for reproducing drawings for use in a shop under conditions of practical service. His first illustration is an example of an ordinary catalog cut but gives practically no details of any value to a shop man, and was probably prepared solely for use in a sales organization. For instance, almost all of the details of the bearings themselves are indistinguishable, and a few larger details that are available will not help out a great deal in any assembling operation.

His second illustration shows a reduced drawing of a freight car frame which, he acknowledges, was taken from a technical article, and as such was prepared solely for the guidance of the reader and not for use of a shopman. Possibly if he had seen the drawing from which this cut was prepared he would have found it totally unlike the usual shop tracing. For instance, probably all the lettering was vastly enlarged so that it would be legible when reduced to the size of cut shown. With further reference to the details shown on this drawing, a shop man could tell at a glance that it would be of little practical service in the shop use because none of the riveting layouts or any of the structural details are shown for the benefit of the shopman and consequently would be either a case of providing additional drawings or leaving it entirely up to the shop man to worry about, which is poor engineering practice. Moreover, in a drawing of this size few dimensions could be shown on it without having it so cluttered up that it would give very poor service.

Another point which would show the impracticability of using too small drawings is the fact that they get dirty and if anyone will lay a dirty, smutty finger on two or three corners of so small a drawing he will find that without doubt important dimensions and other instructions are totally obliterated. The ordinary large-sized blueprint can collect considerable dirt and oily fingermarks and still be legible to the workman.

Lastly, with reference to the production of cuts, I think Mr. Richards would find that they could not be suitably reproduced from the ordinary working drawing, and that it would be necessary to ink in the drawings in order to obtain clear, sharp lines for reproduction by the photo-engraving process. Consequently nothing would be saved by this method over the ordinary work of tracing the drawings so that the cost of one process practically counterbalances the other.

Annual Convention of the Industrial Relations Association of America

The Industrial Relations Association of America met for its fourth annual convention at the Auditorium Theater, Chicago, on May 19, 20 and 21, 1920. The officers in charge of the association (formerly the National Association of Employment Managers) are: President, Philip J. Reilly, Retail Research Association, New York; vice president, John C. Bower, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.; secretary, F. C. W. Parker, Central Y. M. C. A., Chicago; treasurer, John C. Willits, University of Pennsylvania, Philadelphia; executive secretary, Mark M. Jones, Thomas A. Edison Industries, Orange, N. J.

Chambers Studio

PHILIP J. REILLY

Chambers Studio

F. C. W. PARKER

A singular arrangement of the program placed most of the interesting topics for discussion at concurrent luncheon or dinner meetings, and as many as eleven topics were thus placed for the discussion of different groups at widely separated places at the same time. Many of these topics were of interest to the same person, and this overlapping arrangement prevented some of the delegates from obtaining the full value of these discussions. An instance may be noted in "Apprentice Training" and "Shortage of Labor" which in many branches of industry employing skilled help are closely interwoven topics, and yet these were discussed in the same noon-day period before different groups.

On each day, short morning and afternoon sessions were devoted to general discourses with all of the delegates in attendance, but these addresses were usually not sufficiently fundamental in character to furnish a good working basis for individual action.

The afternoon session on Wednesday was devoted to addresses on "Incentives and Production," with the following speakers: H. H. Haylett, Labor Manager, Alfred Decker and Cohn, Chicago; Dean L. C. Marshall, School of Commerce and Administration, University of Chicago; and Frank J. Raymond, The Inter-racial Council, New York. The evening general session on the same day discussed: "Linking Up the Worker and the Finished Product." The speakers were: H. B. Bole, Hydraulic Steel Co., Cleveland, and Harry N. Clarke, The Cort-e-Scope Co., Cleveland.

Subjects discussed at later general sessions included: "Community Conditions Affecting Labor Stability," "The Status of Women in Industry," "The Foreman of the Present and Future," "Organized Labor in Industry," "What Management Wants" and "What Labor Wants." One of the interesting speakers on the subject "Organized Labor in Industry" was E. J. McCome, general manager of *The Buffalo Commercial*, who spoke of the open-shop conditions which are being maintained in that printing plant, claimed to be one of the four newspapers in the United States in which the conditions of a totally "closed shop" do not exist.

This speaker was followed by Sidney Hillman, general president of the Amalgamated Clothing Workers of America, who attempted to convey the impression that his organization was free of the faults that have been charged against other labor organizations to the effect that they are attempting to curtail production and continually raise the cost of living by strikes and wage increases. Another striking address was made by Sherman Rogers, formerly a lumberjack of Oregon, who spoke on the present and past methods of handling labor. He said in part: "If you want to know what makes Bolshevism, go home and take a squint in the glass and you'll see. It is time to stop passing the buck; slam the cards on the table face up where everybody can see them and then we will get somewhere. All men are right when they get the truth. The attitude of employers in staying asleep at the switch and letting radicalism spread has been one of criminal apathy. . . .

"Ninety-eight per cent of labor is right, absolutely square. In the last six months labor and capital have drawn closer together than in the previous hundred years.

"Establish the human contact between the office and the shop, preach the truth openly, come out in the open, quit passing the buck, and it won't take long to convince the worker that the stuff the radicals are preaching is the doctrine of destruction."

A. C. Horrocks, director of education of the Goodyear Tire and Rubber Co., Akron, described the training courses that have been established in their plant for creating supervisory foremen in gang leaders. These courses have proved successful as shown by the constantly increasing enrollment of employees. The first class had about 325 enrolled, the second about 480, and the third, which will complete its course some time in June, has about 2,700.

The foreman of the present found a warm defender in Dudley R. Kennedy of Philadelphia, who claimed that he is just as the management of the present makes him, and that the faults of the foreman but reflect the corresponding faults of the management. He further said, " . . . the foreman is the most abused and least understood man in the manufacturing field today. . . . He is really the solution of the labor problems of the present because he is the sole connecting link between the board of directors and the man with the wheelbarrow."

The Railroad Wage Case

To the Honorable Members of the
United States Railroad Labor Board.
Gentlemen:

The outcome of the Railroad Wage case, which is at present before your honorable body, is of such vast importance to the manufacturers and producers generally, that the Illinois Manufacturers' Association, through its Board of Directors, takes the liberty of submitting the following for the consideration of your Board:

First. The practice of basing wages on the cost of living, without taking into account the work performed for the wages, is, in our opinion, at the very bottom of the present disturbed and unsatisfactory labor condition. It is usual now, in presenting claims for wage advances, to attach an estimated family budget, upon which the percentage of wage increase is predicated. Unfortunately, this family budget is presented only to further the claims of a particular body, but we believe it to be the duty of your Board to consider where a universal application of the budget presented in the railroad case would lead.

If, for instance, we accept the figures submitted by Mr. Lauck, that $1,700 represents the lowest subsistence level and $2,500 the lowest comfort level for an American family, and base the scale of wages in the transportation service on the assumption that every man engaged in this service, no matter where he lives, whether married or single, is entitled to a wage based on a scale with those figures as minimums, would it not be fair to assume that every wage earner in every character of employment everywhere in this country is entitled to a scale based on that same minimum?

From our experience as manufacturers we should say that, if Mr. Lauck's budget were made the basis of a universal demand, the farms, the mines, and the industries would be wholly unable to meet it on a straight-time basis.

If this is true, then you would improve the living conditions of railroad employees by impairing the living conditions of all the other workers.

Your Board can render a signal service to the country by indicating to these claimants that, while wages should be equalized in those cases that have lagged behind in the wage readjustment, wages can't be paid unless they are earned, and that we can't get more out of the common pot than we put into it.

Second. The divorce of wages from production has been one of the calamities of the war, for it has created, in the mind of the wage earner, the delusion that, irrespective of output, performance, or character of service rendered, he is entitled to live on a certain scale. Statisticians spend their time in developing elaborated lists of family requirements, instead of determining how wage increases based on these requirements can be paid.

And so it happens that during the most critical time in the industrial history of the country, when the consumption of commodities has expanded, and world production of commodities has been greatly impaired, we have established a shorter working day, have abolished piece and premium forms of payment, and have imbued the wage earner with the idea that he is entitled to a good living if he but spends eight hours at a job.

We recognize that there is considerable justice in the demand for an increase among railroad workers, and have no intention of arguing against a fair increase.

We do think, however, considering the importance of the decision which you are about to render, that you should emphasize the necessity, during these times of extraordinary prices, that part at least of the increased cost of living shall be met by longer hours of service and increased output, and that piece and premium rates of payment, which during Government operation of the roads were wholly abolished, should be re-established.

Third. The industries have, for the past eighteen months, been adjusting their wage scales to meet the changed conditions. We think your honorable body should be guided in the final determination of wages to be paid, by the rates obtaining in similar crafts in the industries. If the wage scale fixed by your body for the transportation service is above that now current in the industries, it will force another readjustment of wages there, and will be followed by another increase in the price of commodities.

The industries can quickly adjust themselves to conditions of supply and demand in the labor market, but the scale fixed by your Board will be of a rather permanent character.

Unless provision is made for readjustment when conditions change, high wage rates and their concomitants, high freight rates, are likely to endure longer than conditions justify.

Fourth. The advances in cost of living have affected most adversely the lowest paid wage earners, and the increases in the wages paid unskilled labor have, therefore, been largest.

It is only fair to suggest to your Board, therefore, that no uniform percentage increase in wages be granted, but that the rate of wage increase be greater in the lower paid classes than in the higher.

This would but repeat what has actually happened in the wage readjustment of the industries.

CHARLES PIEZ.

Conditions in France

BY MASON BRITTON

PARIS, May 25, 1920

The street lights are burning dimly at night in Paris, hot water is obtainable in hotels twice a week, and most manufacturing plants are shut down one day a week on account of lack of coal—all of which is symbolic of the twilight period through which France is now passing. Daylight is coming fast, however, and optimism appears on all sides as to the near-approaching and ultimate prosperity of France.

The industries are handicapped principally by lack of raw materials, coal and the railroad congestion caused by worn-out equipment.

The recent general strike about which we have read so much in the papers was a fizzle for two reasons—the firm action taken by the Government and the fact that the French workmen are tired of striking and losing the money consequent to strikes. When the strike order went out many of the men obeyed it, but only stayed out for a few days. Practically all of them have returned and manufacturers here think that, except in isolated cases, they will have no more labor

trouble for a long time to come. Some of them have announced a unique policy. When the men in a plant strike, the manufacturers will lock them out for the same duration of time as the men stay on strike. In other words, if the men strike for a week they are forced to stay out an additional week, losing two weeks' pay.

Good machinists are getting between three and a half and four francs per hour. The pay before the war ran from sixty centimes to one franc per hour. A week's work now is forty-eight hours. When the shops are closed down, the men work overtime and thus total forty-eight hours a week. The French workmen like the piecework system and the unions do not seem to be opposed to it. The spirit of the workmen is good, and, when they work, good production is obtained.

Principal Machine-Tool Builders

The following are the principal French machine-tool builders:

H. Ernault, Paris. (Lathes and horizontal borjng machines.)

Gazeneuve, La Plaine Saint-Denis, near Paris.

Bariquand and Marre, 127 rue Oberkampf, Paris. (Lathes, turret lathes, milling machines and small tools.)

P. Hure & Cie, Pantin near Paris. (Milling machines and lathes.)

Jost & Cie, Paris. (Drilling machines.)

Rouchaud & Lamassiaude, Limoges. (Vertical milling machines.)

Lubin & Weiffenbach, Saint-Quen near Paris. (Keyway milling machines, spline-shaft planing machines and cylinder boring machines.)

Philibert, Gamin & Cie, Paris. (Milling machines.)

Cuttat, Paris. Small single-spindle automatic screw machines.)

Guillet & Fils, Auxerre. (Lathes, drilling machines and a complete line of wood-working machines.)

Leflaive & Cie, Saint-Etienne. (Big planers, boring mil's, etc.)

Societe Nouvelle de Machinesoutils, Asnières, near Paris. (Grinding machines.)

Anciens Etablissements. Lomont, Caen (Calvados). (Radial drilling machines, planers, lathes.)

Anciens Etablissements. Requier Frères. Paris.

The French machine-tool builders sell mostly direct, and few of them have exclusive agents, it being an open market and a commission being given to anyone who sends an order. Their prices are much lower than American prices, but, if exchange is figured at normal, it amounts to about the same. A French 16-in. x 8-ft. engine lathe with three-step cone and double back-gears sells for 14,000 francs; a French 36-in. lathe, 15 ft. between centers, all geared-head and single-pulley drive, 70,000 francs; a French 12-in. slotter, with rotary table, 20,000 francs. All of the French builders are busy.

If the dollar exchange stays as it is for an indefinite period, many of the smaller French machine-tool builders will become strong enough to put up real competition when conditions become more normal. Many competent observers believe that the future of the American machine-tool market in France for such standard tools as engine lathes and planers, will be very limited from now on, and that the French, English and Germans will divide this market.

Soon after the Armistice the Ministry of Armament advised the manufacturers in the devastated region not to buy English and American machinery on account of the high exchange rate and to confine their purchases to German and Austrian machinery as far as possible. The Comptoir Central d'Achats pour les Régions Libérées (the official purchasing organ of the Government for the devastated districts) opened offices in Baden, Germany, to help the manufacturers get this machinery. A good deal of it was bought just after the Armistice from stocks that the Germans had on hand, but recently the French manufacturers have been having a great deal of difficulty in getting their orders filled. It is said that the Germans accept orders for such and such delivery at certain prices and four or five times before the tools are delivered letters are received raising the prices and stating that the tools cannot be shipped at the old prices. And, then, when the French agree to the new prices, delivery does not seem to be obtainable. In the majority of cases the new prices equal the Amrican prices.

Only a limited number of English and Swiss tools are coming in. The exchange rate works against them as it does against the American tools, only to a lesser extent. The English tool builders are handicapped, too, by the long delivery quoted. Two or three Belgian concerns are selling lathes here.

Machinery-Using Concerns Busy

All of the machinery-using concerns are as busy as the limited supply of raw material permits. The automobile manufacturers are months behind in delivery and are sold out for from one to three years.

André Citroën, who is making a small light car (thirty miles to a gallon of gasoline), has an output of seventy-five cars a day and is three months behind. Within sixty days, this output will be a hundred per day. Most of the Citroën munition machinery was changed over to motor-car production.

There is a big demand for high-grade labor-saving machine tools, and the only thing that stops a big business is the exchange.

But the French manufacturers have not been educated far enough in the use of labor-saving machinery to pay the existing high prices for American tools. They have been taught too much to buy on price and cannot understand how it is good business to pay what they think is double the value of American tools. Many of the French shops are very small and have only limited capital, which prevents them from making the outlay necessary for buying American tools.

The dealers who have had a stock that was bought when exchange was ten or twelve francs to the dollar and can consequently sell the tools at something like a normal price, from the French standpoint, are disposing of them. The demand for tools bought at the present exchange rates is an emergency one, caused by concerns needing certain equipment to fill out or where some special tools are urgently required.

A great deal of the high-grade labor-saving machinery in the French and American surplus stocks is being rapidly absorbed. The dealers here do not seem to mind the surplus stocks, and say that they could sell all the American tools that they could get at the present time but for the exchange wall.

There are about as many solutions to the exchange problem as there are dealers and buyers. Most of them are predicated on the supposition that the American machine-tool manufacturers have gotten rich during the war and can afford to act in a banking capacity. The most common suggestion is that the manufacturers sell on a ten-franc-to-the-dollar basis, deposit this money in an American bank in Paris and wait for the exchange to become normal. A couple of the large American machine-tool builders tried this but discontinued it.

The same complaint is made by the agents, here, that I reported from London—poor packing and slushing. Shipments from America often lie on the French docks for weeks before they can be moved, on account of the freight congestion. One dealer showed me some high-grade American tools that were practically worthless from rust. The same complaint is made about small tools.

Carpenter Has Started an American Agency

C. E. Carpenter, formerly general manager of the Allied Machinery Co., has started an agency to sell American machine tools. J. Ostertag, until recently with the Director of Sales, War Department, in Belgium, and Birger Erichsen, formerly head of the Allied Machinery Co. in Italy, are associated with him.

R. S. Stokvis & Fils have bought the place formerly occupied by Alfred H. Schuette in Paris. It is a fine showroom and will be occupied about the first of September. A. M. Peskine, formerly with Isnosskoff & Company of Russia, is connected with the Paris office of Stokvis.

F. W. Horstmann & Co. are erecting a new warehouse and showroom about a couple of blocks from their present location.

Agents here also complain that many of the smaller manufacturers still quote f.o.b. factory, not realizing that, while in America their towns are very important, the French maps do not show them. Of course, the only way to quote is f.o.b. New York, unless you want to quote f.o.b. point of destination.

The market here, as soon as exchange becomes more normal, will be good for high-grade labor-saving American tools. They will have to be *sold*, however, and a great deal more care will be needed in the future in the selection of agents. The time for the order-taker in the machine-tool business in France has gone by. Sentiment will not enter into selling anything American any more in France, and the mere fact that a tool is marked "American" does not stamp it high-grade, as it did before the war—too much war-made stuff has almost irretrievably hurt the American reputation. Tools must be *sold* in the future, agents who will *sell* them must be selected and manufacturers will have to keep more closely in touch by having factory representatives here on the ground.

French Looking for More Help

The French are wondering what the American people are going to do to further help them. President Wilson sold them the idea of the League of Nations and then his factory, Congress, refused to deliver the goods. The French business men do not understand our political system and feel that we are leaving them in the lurch. In explaining their recent move into Germany, they seem to be actuated more by a feeling of self-preservation than revenge. They realize that in thirty years Germany will have more than double the number of men of military age than France, and that if French interests and safety are not protected now, they never will be.

"Honor To Whom Honor Is Due"

Some two months ago there died in Syrcause, N. Y., a man who, to judge from obituary notices, was just an ordinary mechanic and an average human being.

If publicity were given to his noble character and the many examples of his unusual manly qualities, he would have his rightful place among great men, instead of sinking into the oblivion of humble mortals who are satisfied with virtue as being its own reward.

As a shop-mate, he was not socially inclined, being rather reserved, though very highly respected He was ever ready to help those who came to him and would give his evenings or Sundays to those to whom he might be of service. He had a real kindness for apprentices who were anxious to get on, spending his time showing them how to do things, telling why they were so done, encouraging the boys through the difficult jobs that so often come up in a boy's early days. The writer recalls in his own experience how, after a strenuous day at what would be considered an ordinary job, the subject of this article listened with patience to the cub's lament and afterward asked if ever he had read "Treasure Island." He had not, but next morning this good friend brought the book to him. It goes without saying that new life was put into the cub after reading in the book of the difficulties overcome.

He would speak ill of no one and would mix in no one's affairs unless invited to do so. He was an excellent mechanic and his general knowledge and experience gave him the foremanship when that position was vacant.

As a foreman he was as square a man as ever drew breath. His aim was to honestly serve the man who paid his salary, at the same time treat the men under him fairly.

He was a student of human nature and could handle each man according to his own peculiarities of makeup and get the best out of him.

He absolutely ignored all gossip—whether it related to others or himself. He once remarked "no matter how fair a foreman tried to be, he was no good anyway."

He had his enemies of course, and right here is where he shone. Among those who were in the shop under him were two old employees who had a stand-in with those higher up. After this man had been appointed foreman by the owner, these two trusties tried to undermine him. Their stand-in made them so bold in it that he could not help but see it. Did he take the usual course of human nature? He did not. Instead of firing them, he reasoned they were good mechanics capable of doing a fair amount of work and as such were valuable men for the employer. He forgot his personal right to a grievance and eventually won them over to good will.

Much more could be said in his favor. He dies as he lived—humble, but a great, real man.

This person was Frank Rooks, many years with the Alexander Iron Works.

J. H. Slater,
Works Manager,
Hydraulic Machinery Co., Ltd.,
Montreal, Can.

What Other Editors Think

The Railroads and the Public

From *Manufacturers Record*

THERE is an old adage that there can be no happiness in a family unless people learn to bear and forbear with each other. Neither side is always right nor always wrong, and the only way that peace and happiness can prevail is through bearing and forbearing, one with the other.

As true as this is in family life, it is pre-eminently true at the present time in that larger national relation which must exist between the public and the railroads. The railroads are bearing the burden for the whole nation which a man harassed by poverty and strain and strife must bear when he is seeking to earn enough to care for his family. He cannot do his best work in any way because of this harassing burden, which strains every ounce of his strength. Nor can he give to his family the comforts which he may in times past have been glad to afford them.

The railroads are in a state of desperate poverty. They are literally hanging on by their eye teeth. For years they have been unable to secure the capital needed to provide facilities for expansion and new rolling stock. They need today not less than five or six billion dollars for immediate work to fill up the vacuum of shortage in rolling stock, rails and ties and terminal facilities. But that money is not available under present conditions, and so the best they can do is to struggle on, making such improvements as they can, utilizing to the best advantage every facility they have, and in doing this every officer of every railroad in the country will be living under a strain akin to that of the man who was once rich but now is poor, as he struggles to maintain his family.

It matters not what have been the mistakes of railroad managers in the past, and they were many, though not all railroad men were guilty. But the innocent had to suffer with the guilty. Today, however, the whole railroad work of the country needs the sincere sympathy, the patient endurance by the public of railroad mistakes and shortcomings, in order that the men at the head of railroads may through public co-operation gradually rebuild their systems into strength and ability to meet the pressure of freight and passenger traffic. We shall see many shortcomings in railroad facilities. We shall see freight handled with exceeding slowness. We shall see fewer passenger trains and more crowded cars than will be for the good of the public. But the railroads are probably doing the very best that is in their power, and will continue to do so. While the public has a right to watch with a jealous eye to see that railroad managers put forth their very best efforts, the public should yet patiently await the return of better times for the financing of railroads and the time which will be needed for providing the hundreds of thousands of freight cars and the thousands of locomotives so badly needed.

Whether a man looks at the railroad situation from this point of view or from the purely selfish standpoint of his own interest, he should recognize that his own selfish interest will be best served by co-operating with the railroads. Every club that hits railroad management will be merely a boomerang to strike the man who threw it. The nation's business life depends upon the rebuilding of the railroads. They cannot be rebuilt except through the heartiest co-operation of the public and the fullest recognition on the part of the public of the fact that the railroads are broken down, that their credit is temporarily gone, and that through two years of Government mis-management they are in a situation for which the whole country is responsible. The Government represents the nation. The Government as representing all the people so managed the railroads as to bring on the present condition, and therefore the people, who are responsible for the Government, are responsible for the railroad situation. It behooves the Government and the people to unite in the utmost effort to rebuild the railroad system, which alone can save this country from a business collapse within the next few years. If transportation completely breaks down, business itself must of necessity break down.

No "Panic" in Sight

From *Iron Age*

IT WOULD be well for those who talk of a "panic" seizing the people of the United States in the not distant future, and those who listen to the talk, to see that they understand the terms employed. A panic involves sudden fear, sometimes unreasoning fear. If a panic were universally predicted and believed in it could not occur, by the very nature of things.

There are different kinds of fears, likewise different kinds of panics. The United States has experienced only one kind of a panic, but many of them; therefore it should not be assumed that when panic is mentioned the one particular kind of panic is the only kind that could occur. Our panics have been money panics, and the Federal Reserve system, put in operation late in 1914, is held to be an almost certain preventive of money panics. There has been much criticism of bankers because of loose use or interpretation of terms, the critics asking why bankers say the present banking system should prevent panics and at the same time say there is going to be a panic. The point is simply that a purely "money panic" may be avoided, while another kind of panic could still occur.

The explanation of why we have had money panics exclusively when there are various kinds of panics is simply that when there is an attack by economic laws or by whatever one chooses to call the attacking force, the weakest thing yields first, and in times past our money system was very weak. If the weak line of defense has been removed to the rear the attack falls upon the next line of defense.

Panics have usually been followed by periods of industrial depression, but it has not been established that the panic is the cause of the depression. There are strong arguments for holding that recognition that an

industrial depression is coming is the cause of the panic. There is much literature on panics and depressions, but a great deal of it is more or less confusing, and the principles deduced are in the main difficult of application. The testimony of some of the historical cases reviewed is made of little practical value for the future by reason of world events interwoven as the cause, when similar events would not occur again. A difficulty which some writers have failed to handle adequately is the separation of real evidence from evidence that is manufactured by the panic and depression itself. In particular, there is the obvious circumstance that a panic and an industrial depression are accompanied by a great decline in commodity prices, the decline making the prices prevailing prior to the panic seem high. Hence the observer is disposed, in the retrospect, to conclude that prices were "too high," whereas instead of high prices having produced a depression it may be a depression causing prices to become unduly low.

On one point, however, practically all the observers are agreed that undue expansion in industry by the conversion of too much liquid capital into fixed capital, by way of productive enterprises being expanded beyond the ability of the public to patronize them continuously, is the most important single cause of industrial depressions. If so, it is a reasonable inference that a panic, or sudden fear, occurs when the unfortunate fact is realized. The case is quite like that of a man who buys a house, difficult of resale, and suddenly discovers he is unable to pay all the taxes and employ all the servants necessary to keep the house going.

If one is willing to take this viewpoint, there can be no question about what he will see. He will observe that the very last thing that threatens the United States is an industrial depression. We have not spent too much money on railroads, but altogether too little. We have not erected too many dwelling houses, but on the contrary almost every other man is feeling keenly the effects of there being too few dwelling houses. We do not have too many hotels and office buildings, the reverse being obviously the case. There are not too many power plants, but too few. We are wasting a large part of the coal we use, and are letting vast quantities of water power go idle, because we have not lived up to our progress in engineering knowledge by installing better methods of coal consumption and by harnessing the water power.

If there is to be no industrial depression, there cannot be any panic produced by sudden realization that an industrial depression is about to come. Eliminating this cause of panic, also the cause resulting from a weak and inefficient banking and currency system, such as we used to get along with in fair weather, there remain some panic possibilities. Commodity prices and wage rates are very high indeed compared with the historic averages, but men are very freely paying the commodity prices and the wage rates, seeking to buy more material than is available and hire more men than there are. These rates may be wrong, and indeed most observers insist they are. A suddenly acquired fear that too much is being paid, resulting in less buying and less employing, would mean a panic, for the country would move practically as a unit. Such a panic would promptly produce a readjustment. Many who assert vehemently "There will be no panic" at the same time believe there will be a readjustmnt or what is often popularly called a "shakeout." It is chiefly a matter of nomenclature or definition of terms. The results of a readjustment would be very beneficial. There being no basis, in overexpansion in construction work, for a prolonged industrial depression, business would be fortified to go ahead with greater physical activity and more confidence.

Neglect of Airplanes Invites National Destruction

FROM *New York Sun*

The decision of the Curtiss Aeroplane and Motor Corporation to abandon all its plans for the manufacture of commercial airplanes in this country is of supreme importance, not only to the industry it affects but to the United States as a nation and to eevry man and women in it. From the day on which hostilities ceased in the war and we were released from the danger which had inspired our costly and feverish efforts to build up an air force to fight Germany, Army, Navy and commercial authorities have urged us to foster and sustain an airplane industry which could be transformed in time of emergency to the uses of national defence.

Soldiers and sailors have instructed us in the imperative necessity of providing adequate squadrons of the most modern airplanes to meet all the varied requirements of the land and water forces.

Engineers have preached to us the facts that in the present state of the art of airplane building a machine is obsolescent when it is completed, and that the organizations of designers and scientists and skilled artisans needed to build them and keep abreast of their development can be formed only by maintaining production at a steady pace.

Bitter experience in the war proved to us that an airplane industry cannot be improvised over night, though every dollar needed be promptly forthcoming, though every ounce of national energy called for be expended, though every individual and every industry which might contribute to success give time and labor and material and service freely and single heartedly.

All these things have been dinned into our ears for months, into the ears of Congressmen, into the ears of executive officers of the Government. Intelligent and far-sighted men and women have urged the adoption of a broad policy of support for the airplane makers; a policy which should make possible the creation of an American airplane industry completely equipped with men and machines for rapid production, for experimentation, for expansion to meet the necessities of any national crisis.

In spite of all there has been no adequate and inclusive program of aircraft production, no Government aid for aircraft producers, no comprehensive scheme to preserve the essential of national defense. The needed encouragement has not been given. Apathy and heedlessness have ruled where enthusiasm and foresight were required. Now we begin to see the consequences.

The Curtiss corporation represents three-quarters of the American airplane industry. Its retirement from the business means the smashup of a great and elaborate war engine sorely needed by this countrv. That smashup is the country's own fault.

Losing our airship shops and their organizations is like losing our shipyards and their organizations. Without them we shall be helpless in another war, and in that war we may not have more provident friendly nations to stand between us and destruction while we seek to repair the errors of our reckless past.

WHAT to READ —for the man in a hurry

Suggested by the Managing Editor

"EVERYWHERE we hear the same story about the lack of good toolmakers, or of high-class mechanics upon whom you can depend to turn out accurate work in a reasonable time." Our leader this week opens with this statement which has been made so often that it is becoming almost bromidic. The sad part of it is that it is undoubtedly true.

Schools of various sorts have sprung up in many places in an attempt to supply the deficiency and have met with varying degrees of success. Fred Colvin describes here the school at the Ford plant in Detroit. Mr. Ford has been the butt of a good many jokes and the subject of much criticism, some of which was probably deserved, but there has been little question of his earnest desire to improve conditions in industry as he found them. Consequently, an apprentice school established by him merits attention.

Most of the prominent presidential candidates have announced their faith in education as a prime necessity for America. We indorse this stand without reservation. Many men in our field have had neither the time nor the money for the advantages of a college education but this is no indication that they are uneducated. To many such men "American Machinist" has been an invaluable aid. It is our aim to make it indispensable and certain comments that have come to us make us believe that we are on the right road.

The *American Machinist* is very much alive to the importance of this matter of training mechanics and has devoted considerable effort to the securing of practical information along this line. We have been fortunate in securing an extensive series describing the training methods in use in a number of large shops and we hope to begin the series in an early issue. The author is a trained observer and an expert in the field of vocational training.

This being the off-week in the "Modern Production Methods" series we are running the first article in a short series on the regulation or control of materials. This installment begins on page 1338 and takes up the subject of material replenishment. It will be followed by others dealing with receipt and storage, with issue for use and with organization and control problems.

Our old friend Dixie is with us again on page 1341. This time he has some pointed remarks to offer on straightedges; how to make them straight and what is perhaps more important, how to keep them straight.

Article XXII of Viall's welding series starts on page 1343 and covers the subject of cutting with the gas torch. Following this is a short sketch of the alloy known as nichrome.

Automotively inclined readers will find Part II of Carhart's article on the Liberty crankcase on page 1361. This installment deals mostly with drilling and reaming operations.

On page 1366 is another special appeal for the support of the new Federated American Engineering Societies. Engineers the country over are vitally concerned in this undertaking and owe it to themselves and to their profession to get behind this plan and push.

Over on page 1371 is a letter from Mason Britton written in Paris on May 25, giving his viewpoint on the general outlook in France. We might hesitate to use our efficient business manager as a writer on design or the fine points of operation but when it comes to selling and general business matters he is one of the best informed men in the field. He gives first-hand information on French machine-tool builders and dealers and also something on machinery-using concerns in general.

We are glad to print, on page 1373, an appreciation of "just an ordinary mechanic and an average human being." How many of us when it comes our turn to check in our tools for the last time will have made records good enough to call forth a letter like Mr. Slater's? Not very many, probably. With a few more men like Frank Rooks in our shops labor troubles would be as scarce as they now are numerous and the way of the labor agitator would be hard indeed. Two sentences in this letter could well be taken as the text for a sermon on foremanship or framed as a creed for every foreman. "His aim was to serve honestly the man who paid his salary, at the same time treat the men under him fairly. He was a student of human nature and could handle each man according to his own peculiarities of makeup and get the best out of him."

Two short articles which come under the head of management appear on pages 1355 and 1358. The first one, by L. L. Thwing, takes up the practical side of appraising the value of second-hand machinery. The other, by John T. Bartlett, gives more of his valuable suggestions for improving the employee's magazine.

SHOP EQUIPMENT NEWS

– Edited By –
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

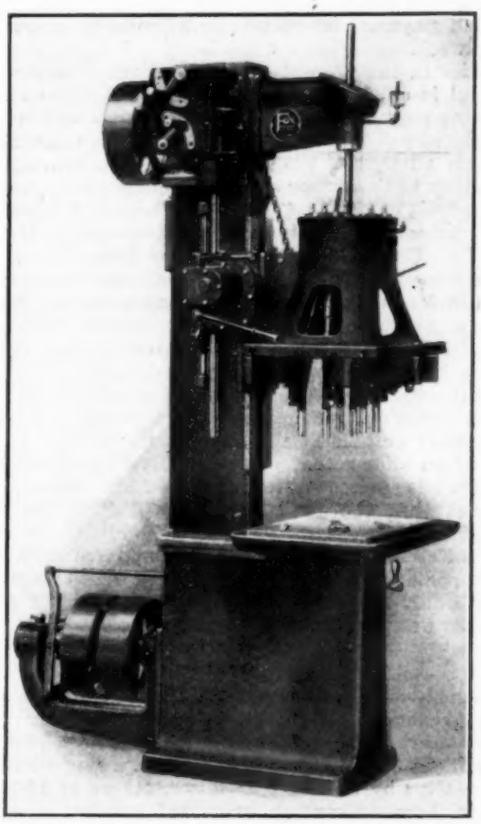
• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Fox Multiple-Spindle Drilling Machine

The D-12 multiple-spindle drilling machine illustrated herewith is one of a series built by the Fox Machine Co., Jackson, Mich.

The table and column are bolted to the base which contains the reservoir for the coolant. The column is of box section and houses the counterweight for the spindle head. The gear box, mounted on the column, contains the spindle change-gears, the shafts for which are mounted on Hyatt bearings. The crown gear on the spindle is carried by a steel sleeve running in a bronze bearing. The feed gears are contained in a box at the side and are controlled by levers on the outside of the box. The feed is engaged by a quick-acting clutch operated by a lever and may be disengaged, either by hand or automatically, by an adjustable stop on the column.

The saddle has a long bearing on the face of the column and is separate from the head which is bolted to it. Spindles are carried in bronze bearings and the thrust is taken by ball-thrust bearings. Spindles are provided with two spindle-gears permitting variation of relative speeds and which can be shifted to neutral position for spindles that are to remain idle. The drive is constant speed.

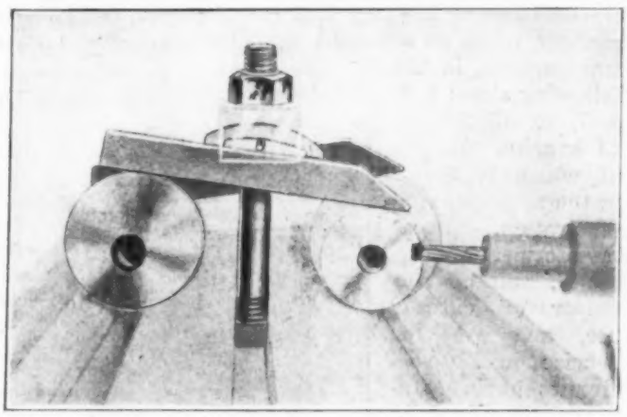


FOX D-12 MULTIPLE-SPINDLE DRILLING MACHINE

Specifications: Head; travel, 15 in.; drilling surface (rectangular) 8 x 14 in., (round) 12 in. Center of head to face of column, 12 in. Table; working surface, 17 x 22 in.; height from floor, 32 in. Number of spindles, 10 to 16. Clutch pulley; size, 14 x 4½ in.; speed, 450 r.p.m. Power required, 10 hp. Floor space, 28 x 36½ in. Height, 105 in. Weight; net, 2,250 lb.; crated, 2,500 lb.; boxed for export, 2,900 lb. Export box, 96 cu.ft.

Force Universal Clamp

Burwin Co., Inc., 87 Warren St., New York City, has placed on the market the Force Universal Clamp made by the Black Rock Manufacturing Co., Bridgeport, Conn.



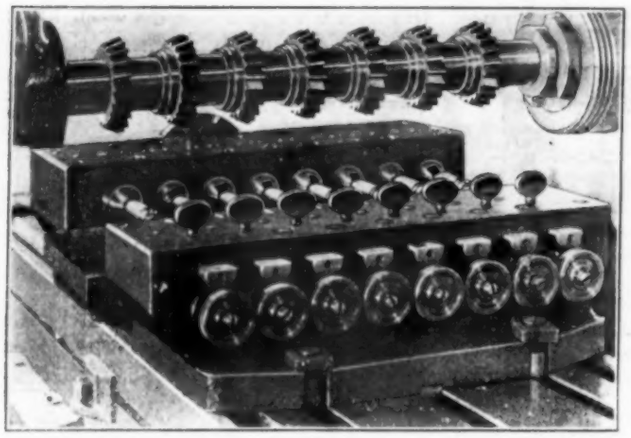
ONE TYPE OF FORCE CLAMP HOLDING IRREGULAR WORK ON MILLING MACHINE

The accompanying illustration shows one style of the clamp for general use. The clamp is designed for holding work on machine tools, being particularly adapted to clamping irregularly shaped pieces, straddling bosses, or fitting different angles by means of the swivel adjusting device.

The clamp is made of hardened steel and in a wide range of sizes.

Scully-Jones Multiple-Spindle Dividing Head

Scully-Jones Co., 80 East Jackson Boulevard, Chicago, Ill., is the manufacturer of the multiple-spindle dividing head shown in the illustration. The spindles are all driven from an index plate located at the opposite end of the machine from that shown in the illustration.



SCULLY-JONES MULTIPLE-SPINDLE DIVIDING HEAD

The work drivers are somewwhat flexible so that they may be adjusted to suit work that is off center. Both the index plate and the work drivers are made to suit the needs of the user of the tool. All parts of the device are interchangeable. The dividing heads are built in six sizes with 2, 4, 6, 8, 10 or 12 spindles, as may be required.

The device may also be arranged for cutting either spur or helical gears.

General Electric MTQ Auto Transformers

The General Electric Co., Schenectady, N. Y., has recently listed as standard equipment 1:1—ratio auto transformers in the following sizes: 1, 3, 5, 7, 10, 15, 20 and 25 kva. output, one of which is shown in the accompanying illustration. These transformers are air-cooled, suitable for indoor or outdoor use, and are for service on 220-volt circuits having frequencies between 50 and 140 cycles per second. They are designed for deriving 3-phase current from 2-phase, 4-wire service, and vice versa; and they cannot be used either for 2-phase, 3-wire service, or for operating motors with inter-connected phase. These standardized transformers are adaptable to a wide range of work, their principal application being to adapt polyphase motors to any circuit.

GENERAL ELECTRIC CO. MTQ 10-KVA. AUTO TRANSFORMER

Business Conditions in England

BY OUR LONDON CORRESPONDENT

London, May 14, 1920.

The only astonishing feature of the ballot taken among engineering workpeople on the question of payment by results, is the small number actually voting, namely, 14,170 for and 54,167 against, with a majority against the system of 39,997. This result was certainly not unexpected; in fact five to one was unofficially reported. Engineers and many British workmen have long expressed their opposition to piecework, premium bonus, etc. Nevertheless, particularly perhaps in the Birmingham and Coventry districts, large numbers work on one or other of these systems, and some at least would be sorry to change.

The employers are understood to have claimed the right to introduce any system in any district, subject to safeguards as to insurance of standard rates, cutting of prices, etc. In practice this would have one rather important effect: it would deprive the district trade-union committees of much of their power. That they have power and are prepared to use it was shown in the recent molders' strike that was supported by these local committees, though frowned on officially by headquarters. The point is that the district committees would lose control of the local workshop conditions, as far as they have it, and that this did actually happen during the war owing to the working of the labor dilution schemes, has been asserted.

OUTPUT HAS DECREASED WITH REDUCTION OF HOURS

Exactly what will follow cannot be seen, everything depending on the attitude of the employers. When the normal working week was reduced from 53 to 47 hours, it was understood to be a condition that output should be maintained and every endeavor actually made to increase it. Generally speaking the reverse has happened. It is therefore quite on the cards that the employers may use the refusal of payment by results to attempt to revert to the 53-hour week.

Whether in the present condition of trade they would be successful is quite a debatable point, while here and there indications may be found making toward a decline on the whole, the actual existance of a machine, or in fact any commodity, is all that is needed to ensure its sale at a price satisfactory to the owner and presumably to the purchaser. Obsolete tools can in fact be sold. There is but little prospect at present of foreign competition—which is another name for German competition—breaking down prices. True, a consignment of German tools has reached Great Britain and can be seen in Leeds and London. There are both new and second-hand, and in certain instances the prices of the new tools are below current rates. This, however, must be regarded as exceptional, for the German export authorities maintain fairly complete control of such matters, insisting, for instance, that payment must be in the currency or bills of the importing country. In the instance of an offer recently brought before the notice of the writer, while prices were mentioned in marks, it was stipulated that the mark was regarded at the pre-war value of 1s.

The difference then in price as compared with that of a corresponding British tool was very slight; not in fact such as would suggest an attempt on the part of a British firm to act as agent.

TOOLS IN THE CONSIGNMENT

The consignment of tools noted above included a Bilgram bevel-gear shaper by Reinecker, a gear hobbing machine, a Wotman crank-drive shaper of 16-in. stroke, plain grinding machines of the Norton type, 12-in. swing by 50 in. between centers by Schubert & Salzer, others of 15-in. swing by 39 in. between centers, universal grinding machines of the same sizes, and a number of Landis-type machines of 10-in. swing by 30 in. between centers, all by the firm named. These tools were part of a purchase by a firm of printers' engineers not directly known as machine-tool merchants. The object of purchase in the first instance was to supplement the plant in the firm's own works, which were

being reorganized and for which the tools were wanted quickly. It is gathered, by the way, that German printing machines have been on offer through Scandinavia.

Pay Question Up Again

To return to the subject of payment by results, the suggestion has been made that the engineering workpeople, not content with turning-down the employers' proposal, will make their own, based on a collective contract. It is said that experiments on these lines have already been made in several workshops. Inquiry at the headquarters of the chief engineering trade union has not disclosed the firms concerned. The experiments would appear to be quite unofficial. Apparently, the idea is for a department, through its shop committee, to enter into a contract as to the price to be given for the department output, payment being divided among the workers according to an agreed basis.

A somewhat similar system is actually being worked in the shops of a well-known Birmingham firm, where the price for the machining of each complete article is set not by the workers, but by the employers, this of course by agreement as to reasonable amount. The machines are arranged in relatively small gangs and the operations are timed so that the work passes successively from one machine to that geographically next until it is finished, the price of the work then being divided among the men concerned according to their wages. In this particular instance of progressive machining it is not uncommon for the men to make a bonus of 90 per cent on their standard rates.

It may be worth mentioning that while the skilled workers seem to be decidedly against payment by results, the unskilled and semi-skilled men have agreed to the system, or at least those in authority in the unions have agreed to recommend it to them. They include the class of worker engaged mainly on repetition work and it is held that consequently it is much easier to set prices for these than for really skilled men.

Unions To Combine

The rules are being prepared by the engineering union that will absorb nearly a dozen existing unions. The new organization, to be known as the Amalgamated Engineering Union, will have funds of about three and one-half million pounds, the membership being about 460,000. The most important unit in it is of course the present Amalgamated Society of Engineers. After a second ballot the Society of Amalgamated Toolmakers has now joined, bringing in more than 46,000. The new rules are expected to provide for the ordinary members a more direct influence on policy and greater control of working conditions by shop officials. At present the wages for time workers vary somewhat, according to the district, the minimum in the London area being about 88s. a week, with say 80s. at Colchester 50 miles away. Apparently, the aim is to raise the standard rate to £6 10s. (130s.) a week, after which payment by results will be considered.

Financial Conditions

The government obtained the second reading of the finance bill and the opposition to the new excess profits duty has not proved brilliant. A further attack however will be made on it in the committee stage by representatives of the manufacturing interests, and an amendment will probably be proposed by way of revision of standards of profits, and in connection with the remuneration of directors, the valuation of stocks, the reckoning of debentures and loans as part of the capital of the business, and so on. The Chancellor of the Exchequer offered to substitute a flat rate of 5s. 6d. in the £ if all firms paid, or 7s. 6d. in the £ for firms that at present pay the duty named, this suggesting that firms at present liable to the duty are about 70 per cent of the total.

Both the ordinary household and the industrial worlds were startled this week by the official raising of coal prices, in the case of household coal by 14s. 2d. a ton and of industrial coal by 4s. 2d. a ton. It is clear that all articles manufactured will be raised in price once more, and miners, railwaymen and engineering people will, it is anticipated, use this increase in the cost of commodities in their claims for higher wages. In fact it is thought that the whole body of industrial workers will move in this direction. It has been estimated in a rough and ready way that the increased cost of coal will cause a further advance of between 15s. and 20s. a ton on prices of finished steel. At the recent London market, by the way, it was suggested that the higher prices demanded have driven off part of the inquiry from abroad. Reports from other areas also suggest a more scrutinizing attitude toward prices. The whole demand is, however, well in advance of production. Some German steel plates are, it is understood, being delivered, but relative to the call this supply is insignificant.

New Enterprises

A new firm, a wheel manufacturer, is having built at Brixton, S. W., a factory with an area of about 22,000 sq.ft. on one floor in three spans, each of about 19 ft. The ninety-three north light trusses for the roof are assembled and held in simple jigs placed on the ground, the various members being previously cut to length. The joints are thus welded by the arc process, using electrodes. Gusset plates, etc., are welded on. The stanchions are cut to length and have cap and base plates welded similarly, and the joists are lifted on to the cap plates and clamped to position while being welded. The trusses are then lifted to place and welded to the joists. The guttering also is welded. The time for assembling and welding one truss, employing one welder and two laborers, is stated to be 50 min., and one welder and one laborer can complete a stanchion in 30 min. The cost of electric welding is said to be £11 or less per ton, as against £18 to £20 at present where drilling, bolting, riveting, etc., is the rule, this of course apart from the cost of the steel work itself. Further as to times, the firm concerned states that at Brixton a joist can be fixed on the cap plate in 15 min. and the trusses fixed at both ends in 30 min. by one welder. Steel buildings to be used for the forthcoming horse show at Olympia, London, W., are also being erected in the same way, the floor space being about 9,000 sq.ft. and the span about 14 ft., the price being the cost of material plus £10 a ton. The same system of welding is put forward for tying rods and wire employed in reinforced-concrete construction.

Armstrong Whitworth Prominent in Building Locomotives

While all the ordnance firms have turned over to peace production, none seems to be quite so prominent in this direction as the Armstrong-Whitworth concern, possibly because its orders are largely for locomotives, in which there is a marked shortage both in Great Britain and on the continent. The firm has, for example, just obtained a repeat order for twenty-five 6-coupled side-tank locomotives for the English Northeastern Railway, one of its first orders being for fifty 8-coupled goods engines and tenders for the same company. Indeed the conversion of Armstrong-Whitworth's Scotswood works from munition-making to locomotive-production was carried on while these engines were being built. The development of the works for this purpose is, in fact, continuing. The marine engineering works at Elswick are also fully occupied. The Beardmore organization has also turned largely to locomotive building, and the ordnance and armour plate shops at Parkhead, Glasgow, are being turned to this purpose. At Dalmuir the construction of locomotives proceeds in a department that formerly was engaged on gun mountings, and locomotive repair work is also being undertaken, a Scottish correspondent mentioning that 60 engines are at the moment thus being treated by the Beardmore firm.

The cost to the engineering industry of the molders' strike is but a matter of estimate. The loss of funds on the part of the trade unions concerned can of course readily be known. It has come out that the Ironfounders' Society expended all its available funds—that is, about a quarter of a million pounds—and moreover borrowed some £50,000, so that the loss here is about £300,000. The employers naturally had their losses, but think they have learned a lesson, and the next strike of a similar character, probably the next industrial dispute, will not be fought the same way.

SPARKS FROM THE WOR

Valentine Francis

Metropolitan Section of S. A. E. Discusses Piston Rings

A meeting of the Metropolitan Section of the Society of Automotive Engineers was held on the evening of Thursday, June 10, in the rooms of the Automobile Club of America on 54th St., New York. Arrangements were completed for transportation of members of the S. A. E. Convention at Ottawa Beach, Mich.

The subject under discussion at the meeting was Piston Rings. Charles G. Nilson delivered a very able and comprehensive address, illustrated by lantern slides, briefly sketching the history and development of piston rings from the days of James Watt to present-day automotive engines, with a discussion of ring sections, wall pressure, wear and leakage.

Representatives from many of the leading manufacturers of piston rings were present and a general discussion followed the reading of the paper, in which many points of interest were brought out.

L. I. Yeomans Becomes Manufacturer

Lucien I. Yeomans, the man who put the Amalgamated Machinery Corporation, of Chicago, on the ordnance map, has severed his connection with that concern. He will retain his office in the Edison Building, Chicago, as general consulting engineer, and will manufacture and put on the market various small tools and devices of his and others' design.

Born at Walworth, Wayne County, New York, April 3, 1878, Mr. Yeomans has crowded a world of mechanical experience and achievement into his life. He served an apprenticeship with Brown & Sharpe and after leaving them worked as machinist, patternmaker, toolmaker and foreman in a number of shops in diversified lines. He returned to Brown & Sharpe in 1900 and shortly afterward was employed by Governor Goodell, Antrim, N. H., to develop a line of apple-paring machines, since some of Mr. Yeomans' earliest experiences were in the machine and cooper shops of the great New York apple district. While in the employ of Governor Goodell he designed and patented what is said to be the only successful full automatic apple-paring and coring machine ever made. He later became superintendent of the shop of I. S. Heald & Son, at Barre, Mass., and moved its shop to Worcester where the business was, and is, continued under the name of the Heald Machine Co. From Worcester he went to Madison, Wis., as superintendent of the gasoline-engine plant of the Fuller & Johnson Manufacturing Co. From Madison he went to Chicago as assistant superintendent of production for the Link-Belt Co., later becoming general superintendent. His next step was assistant superintendent of the motive-power department of Armour & Co., and at the end of six months he was made superintendent.

In 1913 he opened offices in the Edison building, Chicago, as consulting engineer, and he still retains them. In 1915 he designed and patented a

L. I. YEOMANS

line of shell machines which were built by the Amalgamated Machinery Corporation and which were fully described in the *American Machinist*, May 11, 1916. His work on these lathes won him the John Scott medal given by the Franklin Institute.

It was in connection with the making of large gun-boring lathes that he designed and built some of the largest planers ever made. These were largely of concrete, with beds 184 ft. long, 17 ft. wide and 18 ft. from bottom of bed to top of housing. Each planer contained approximately 212,000 lb. of iron and 13,500 cu.ft. of concrete, reinforced with 17 tons of steel bars. At the time the armistice was signed a planer with a 500-ft. bed was under construction.

This brief outline will give the reader an idea of the kind of man who, for four and one half years as works manager of the Amalgamated, gave the best that was in him to help us win the war, and who now is starting into other fields.

New Departure Has New Hotel Club for Employees

The new hotel-club being erected by the New Departure Manufacturing Co., at Bristol, Conn., will be ready for occupancy by Sept. 1. The building will will be used strictly for the employees and will be one of the best of its kind anywhere in the United States.

In the basement will be located pool and billiard tables, bowling alleys and a barber shop. The first, or street floor, will contain a cafeteria, where food will be served for a reasonable price. Here also will be located a large lounging room and lobby. The second, third, fourth and fifth floors will be entirely devoted to sleeping rooms and tub and shower baths. The sixth story will be used exclusively for club purposes. The exterior of the building is very attractive also.

At present there is a contest on for factory employees of the N. D. Co. to guess a name for the new hotel, and the one chosen will receive a $10 gold piece from President Page of the company.

Work in Connection with Industrial Safety Codes

During the month, the final list of changes proposed for incorporation in the "National Electrical Safety Code" was sent out. As soon as comments from the interested parties have been received, the new edition of this code will be sent to the printer and it will be available for distribution late in the summer. A similar stage has been reached in the case of the first edition of the "National Safety Code for the Protection of the Head and Eyes of Industrial Workers." This code is being prepared in co-operation with an advisory committee of experts in this subject and final changes have been sent to the committee for consideration. This code is also to be printed in the near future by the Bureau of Standards.

Southern Stove Manufacturers' Meeting

The annual convention of the Southern Stove Manufacturers' Association was held at Rome, Ga., June 8 and 9. The convention was attended by representative men of the industry from the Southern states. Topics of pertinent industrial interest were discussed in open forum following talks by prominent men. There are four stove foundries in Rome which is one of the centers of the industry in the South, and officials of these companies acted as hosts to the visiting delegates.

LD'S INDUSTRIAL FORGE
News Editor

Floating Foreign Trade Exposition an Assured Success

Hundreds of inquiries from manufacturers and others located in every state in the Union testify to the interest in the First National Foreign Trade Floating Exposition, announcement of which was made recently. The largest exporting firms in the country have signified their intention of joining in the idea which will place American exporters on the same basis as the merchants of Great Britain and Japan. Negotiations are under way for the refitting of a vessel large enough to accommodate the exhibitors of American products so that, from present indications, the boat will leave New York during October as per schedule.

The exposition offices at 50 Broad St., New York, have been enlarged to take care of the inquiries that are arriving by every mail, thus proving that American manufacturers, interested in foreign trade, are alive to the opportunities presented by this novel method of introducing their wares to foreign customers.

In a statement, explaining the objects of the exposition, W. P. Brawley, New York manager said:

"The need of any facilities to cement more firmly our relations with the foreign buyer of American manufactured goods is very evident. The support and co-operation we have received from all sources has heartened us in our idea. The functioning of this exposition ship can be expressed in very few words. The vessel will do away with the present method whereby an individual manufacturer must send his representative with sample cases to the foreign countries where he desires to introduce his merchandise. This method which entails the setting up of an exhibit in a sample room for the purpose of interesting prospective buyers is very difficult. The aim of the floating exposition is to do away with this inconvenience and to enable American manufacturers to exhibit their goods advantageously in a manner that will attract the foreign buyer.

"Publicity is being given to the project in Central and South America and the Far East at this time. Preceding the ship some six weeks or two months, a competent publicity man will arrange for an advertising campaign. An interesting feature of the visit at the foreign port will be the program to be outlined by an entertainment committee to be selected by the exhibitors. After sufficient time has been devoted to the more interested visitors the ship will be thrown open to the general public.

"The floating exposition will stop at the most important ports only and the duration of the stay will vary from five days to two weeks. Interpreters will be on board with a view to promoting business relations between the representatives of American exporters and the buyers who came to view the exhibits. The exhibits will be segregated according to classification; that is, there will be a special department for textiles and wearing apparel; another for hardware; one for foodstuffs, etc. While it is not the intention to have exclusive exhibits, it has been decided that not more than one exhibitor of competitive lines will be accepted.

"Experts versed in all the phases of foreign-trade methods will be on hand to advise exhibitors and prospective purchasers.

"The itinerary embraces the particular ports of Central and South America, New Zealand British Strait Settlements, Australia, Philippine Islands, China and Japan. The trip will be of eight months' duration. The primary objective is to furnish a convenient and economic means for the manufacturer to have his personal representative come in actual contact with the foreign buyer by compounding a number of firms and having one ship devoted wholly to their activities."

Yale & Towne Manufacturing Co. Announces Change in Personnel

At a recent meeting of the Yale & Towne Manufacturing Co., Stamford, Conn., several changes were made in personnel of the company. The resignation of John B. Milliken as treasurer of the company, which had been presented at a previous meeting, was accepted and a resolution expressing the regrets of the company was presented to him. Willard L. Case was elected to succeed Mr. Milliken.

At the same meeting Edward C. Waldvogel, who has been in the employ of the company for fifteen years, four of which were spent as general manager, was elected a director.

To Equip Spanish Steel Mill

The Compania Siderurgica del Mediterraneo of Sagunto, Spain, has placed a contract with the Alliance Machine Co. of Alliance, Ohio, for openhearth charging and crane equipment. It has also placed a contract with the Pennsylvania Engineering Works, New Castle, Pa., for a 600-ton hot metal mixer. The machinery is to be installed at the new iron and steel works now in process of construction by the company at Sagunto.

Interstate Commerce Commission Defines "Scrap Iron"

A recent decision of the Interstate Commerce Commission regarding the shipment of scrap machinery might be of interest to dealers and manufacturers. The Griess-Pfleger Tanning Co. entered a complaint with the commission alleging an overcharge in freight rates on a shipment of a broken press bed from Waukegan to Champlain, N. Y. The company contended that the bed was cracked to such an extent as to make it unrepairable, but the bill of shipment described it as a "press"—therefore the railroad charged the regular rates as for shipments of machinery. The company asked that the charges be made the same as for scrap iron, which are considerably less than those for machinery.

After a review of the case and taking the testimony of several witnesses, the commission decided in favor of the railroad and dismissed the complaint.

Electrical Society Chooses Officers

At the annual meeting of the New York Electrical Society, held on June 8, officers for the coming year were elected. W. N. Dickinson was chosen president, succeeding Edwin B. Katte. Ernest W. Muller, Charles E. Speirs and J. M. Buchanan were elected vice presidents. For the 23rd time, George F. Guy was elected secretary. He has served in this office almost since the organization of the society. Another re-election was that of Thomas F. Honahan as treasurer.

The New York Electrical Society is the oldest organization in the electrical field. It was formed in 1888 when the lighting industry was in its infancy and it has always been a potent factor in electrical progress.

Mr. Dickinson, the new president, is a consulting engineer, connected with the Otis Elevator Co. During the war he was engaged in war work at Washington.

Oil Associations Hold Joint Conference

Presidents, superintendents and managers of oil mills in the five Southeastern states gathered in Atlanta, Ga., recently for the joint conference of the Interstate Oil Mill Superintendents' Association and the Oil Mill Machinery Exhibitors' Association. About four hundred delegates attended the meetings, which lasted for three days, and the exhibit at the Atlanta auditorium. About one hundred firms occupied space at the auditorium for exhibits, which included oil mill machinery, etc.

Exhibition and Conventions of Railroad Men

A million-dollar exhibition, staged recently at Young's Million Dollar Pier, Atlantic City, N. J., was an important auxiliary to the combined conventions of the railroad men.

The American Railroad Association is an old, thoroughly organized and well-managed society that had its beginning in the nineteenth century. Owing to the vast size of the organization, it comprises several branches, some of which have been formed within the past year or two. The purpose of these is to sub-divide and handle more efficiently the big business of railroad engineering and equipment. The sub-divisions meeting in the June conventions were section III (mechanical) and section VI (purchases and stores).

The Railway Supply Manufacturers Association is not affiliated with the American Railroad Association, but meets with them merely as a matter of mutual benefit and convenience.

The several conventions followed each other in continuous daily sessions, from June 9 to 16, and the meeting as a whole was the most enthusiastic and successful in the history of the organizations. As an indication of this the registered attendance, which included many visitors from Canada and abroad, exceeded six thousand. This was much greater than that of any previous convention of the association. As to the exhibition, it was stated that although the space available for exhibits amounted to a total of 100,000 sq.ft., there was not enough space to supply the demand, even with curtailed allotments. In this connection a noteworthy feature, due to good management, was the promptness in which the shipments of exhibits were handled during these days of strikes and embargoes. With one or two exceptions the shipments arrived on schedule time in an almost mysterious manner.

The exhibition included a number of machine tools in full operation and in charge of expert operators, and some of the demonstrations of both the machine and tool were surprising even to those familiar with mcdern shop practice. In addition to the power-operated machines and equipment in Machinery Hall, there was a full line of railroad equipment, supplies, tools, etc., displayed in Exhibition Hall and other sections of the pier, including the annexes and balconies. Acetylene welding and cutting was demonstrated at the extreme end of the pier on account of the fire hazard.

The daily sessions in Convention Hall were devoted to consideration of the problems of railroading and the papers and discussions dealt comprehensively with the latest devolpments in engineering and equipment. Among these were, "Mechanical Stokers," "Modernization of Stationary Boiler Plants," "Fuel Economy and Smoke Prevention," "Auxiliary or Safety Connections Between Engine and Tender," "Design, Maintenance and Operation of Electric Rolling Stock," "Scheduling and Routing Systems for Locomotive Repair Shops," "Superheater Locomotives, and Snow Fighting Apparatus."

Other subjects taken up the following day were: "Locomotive Headlights and Classification of Lamps," "Feed Water Heaters for Locomotives," "Locomotives as a Big Investment," "Design and Maintenance of Locomotive Boilers," "Engine Terminals, Design and Operation," and "Train Resistance and Tonnage Rating." The fourth day's session was devoted to reports and discussions on "Autogenous and Electric Welding," "Specifications and Tests for Materials," "Repair Shop Layouts," "Standard Blocking of Cradles of Car Dumping Machines," "Standard Method of Packing Journal Boxes," and "Establishment of a Cooperative Research Bureau." On the fifth day the discussions included "Revision of Passenger Car Rules of Interchange," "Prices for Labor and Materials," "Depreciation for Freight Cars," "Arbitration," "Tank Cars," and "Brake Shoe and Brake Beam Equipment."

The subjects handled on the last day of the convention were: "Couplers and Draft Gear," "Car Wheels," "Car Construction," "Loading Rules," "Train Brake and Signal Equipment," "Train Lighting and Equipment," and "Safety Appliances."

At the conclusion of each day's business, the delegates and guests with their wives and friends enjoyed varied forms of high-class entertainment provided by the entertainment committee. The Railway Supply Manufacturers' Association elected the following officers: President, J. F. Schurch, of the T. H. Symington Co., Chicago, Ill. Vice president, C. D. Jenks, Cleveland, Ohio. Executive committee members: For the first district, comprising New England and Canada, G. W. Denyven, succeeding J. G. Platt; second district, comprising New York and New Jersey, W. K. Krepps, succeeding C. D. Eaton; fourth district, Ohio, Indiana and Michigan, Edward M. Savercol, succeeding C. D. Jenks; fifth district, Illinois, S. B. Sherman, succeeding E. H. Bankard, Jr.; seventh district comprising Wisconsin, Minnesota, Louisiana and states west of the Mississippi River, Sterling Campbell.

The officers elected by Section VI (purchases and stores) are: Chairman, H. C. Pearce; vice chairman, H. E. Gray; on the general committee for two years, E. N. Bender, F. A. Bushnell, J. P. Murphy, H. H. Laughton, W. G. Phelps, J. G. Stuart, W. A. Summerhays; members for one year, U. K. Hall, W. A. Hopkins, D. K. Jellison, F. D. Reed, F. B. Wight, H. P. McQuilkin and E. J. McVeigh.

It was announced that the convention of the association would be held in Atlantic City again next year.

The National Steel Rolling Co., Newark, N. J., will build a plant in Baltimore having a daliy capacity of 25 tons of bar iron and bar steel.

B. G. Koether Promoted in General Motors Corporation

B. G. Koether, whose promotion to vice president of the Hyatt Roller Bearing Co., the early part of the year, brought to him the congratulations of his large circle of friends throughout the industry, has now been made assistant general manager of the Hyatt Division of the General Motors Corporation.

Although he still remains a vice president of the Hyatt selling company Mr. Koether has relinquished his duties as director of sales and advertising work to devote his entire efforts to boosting Hyatt production

C. M. EASON

to meet the tremendous demand he so recently played an important part in creating.

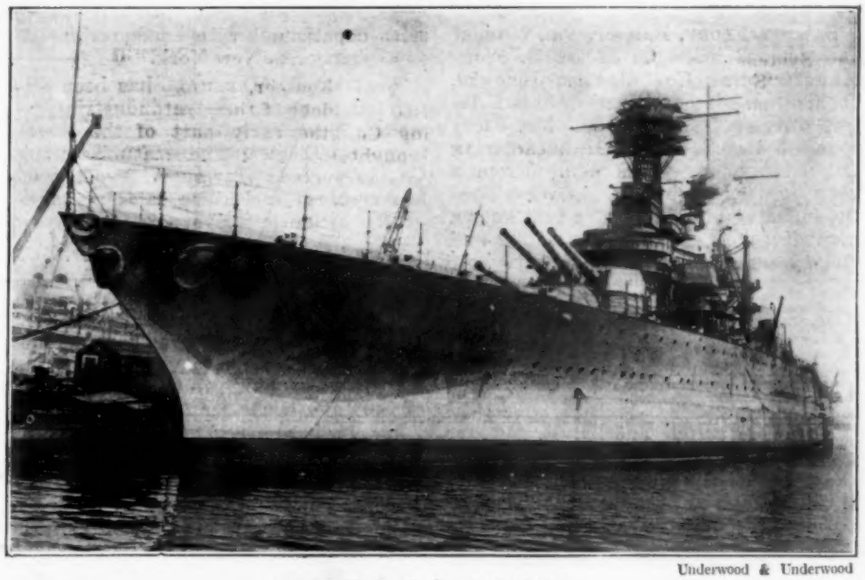
This work will keep his at the company's plant at Harrison, N. J., where he has made his headquarters since leaving Detroit.

Coincident with Mr. Koether's change to work more closely identified with the factory, comes the appointment of C. M. Eason, widely known in the trade for his development of the tractor business of the Hyatt Roller Bearing Co., as sales manager of that department.

Mr. Eason will take up the sales work formerly handled by Mr. Koether, this marking his return to the company after several months as general manager of the Engineering Development Co., Moline, Ill., an organization which had been formed to serve in advising and consulting capacity.

Short News Note

At the Exposition of the Railway Supply Manufacturers' Association on Young's Million Dollar Pier, Atlantic City, N. J., June 9-16, 1920, the Chesapeake Iron Works, of Baltimore, Md., had an exhibit and display illustrating the merits and special features of the Chesapeake electric traveling crane — a "standardized" crane — as applied in railway and other heavy work.



Underwood & Underwood

THE U. S. S. TENNESSEE

The United States battleship "Tennessee," which went into commission on June 3, is the most powerful fighting vessel in the world today. She is 625 ft. long, has a beam of 98 ft., and displaces 32,500 tons. Her main battery consists of twelve 14-in. guns, and she is protected by a belt of armor 14 inches thick. She is electrically propelled, her main engines consisting of two Westinghouse turbine generators, rated at 15,000 kva. each, and each of her four propellers is driven by an 8,000 hp. Westinghouse motor. Her maximum speed with full power is 21 knots.

New Officers of the National Research Council

The National Research Council, a co-operative organization of leading scientific and technical men of the country for the promotion of scientific research and the application and dissemination of scientific knowledge for the benefit of the national welfare, has elected the following officers for the year beginning July 1, 1920: Chairman, H. A. Bumstead, professor of physics and director of the Sloane physical laboratory, Yale University; first vice chairman, C. D. Walcott, president of the National Academy of Sciences and secretary of the Smithsonian Institute; second vice chairman, Gano Dunn, president of the J. G. White Engineering Corporation, New York; third vice chairman, R. A. Millikan, professor of physics, University of Chicago; permanent secretary, Vernon Kellogg, professor of biology, Stanford University; treasurer, F. L. Ransome, treasurer of the National Academy of Sciences.

The Council was organized in 1916 under the auspices of the National Academy of Sciences to mobilize the scientific resources of America for work on war problems, and reorganized in 1918 by an executive order of the President on a permanent peace-time basis. Although co-operating with various Governments scientific bureaus it is not controlled or supported by the Government. It has recently received an endowment of $5,000,000 from the Carnegie Corporation, part of which is to be expended for the erection of a suitable building in Washington for the joint use of the Council and the National Academy of Sciences. Other gifts have been made to it for the carrying out of specific scientific researches under its direction.

Business Items

The Hergi Manufacturing Co. has recently moved into a new and larger plant at Fifth St., Bridgeport, Conn.

The Gillespie Manufacturing Co., Gillespie Motor Co., Gillespie Foundry Co. and the Brokaw-Eden Co. announce that they consolidated on June 1, 1920, under the name of the Gillespie Eden Corporation, with executive offices at 50 Church St., New York. Under this consolidation the Gillespie Eden Corporation will manufacture the Eden washing machine and the castings, motors and wringers used in its production.

The Batavia Steel Product Corporation has sold its plant in Batavia, N. Y., to the Gray Machine Tool Co., Inc., Buffalo, N. Y. The Gray people manufacture thread millers and a piston blasting machine and other automatic machinery.

The Greenfield Tap and Die Corporation, Greenfield, Mass., acquired 100 per cent of the common stock of the Lincoln Twist Drill Co., of Taunton, Mass. This company manufactures twist drills, reamers and milling cutters. These, added to the products of the Greenfield Tap and Die Corporation, give it a complete line of small tools.

The new plant of the Wayne Steel Co., Erie, Pa., poured its first furnace on May 29. The plant is 100 x 150 ft. It is equipped with two 25-ton basis openhearths, having an annual capacity of 30,000 to 35,000 tons. The concern will manufacture basic openhearth steel ingots, blooms, billets, bars and shapes, nickel and alloy steel. The officers are L. A. McElroy, president; B. S. Fletcher, vice president; H. H. Hanchett, secretary; J. S. Curtis, treasurer; R. C. McElroy, assistant to the president. The directors are L. A. McElroy, R. C. McClenathan, A. C. Pratt, C. B. Shaffer, B. S. Fletcher, R. C. McElroy and J. S. Curtis.

The Pennsylvania Pump and Compressor Co., of Easton, Pa., announces the opening of sales offices in New York; Philadelphia, Pa.; Pittsburgh, Pa.; Richmond, Va.; Birmingham, Ala.; Salt Lake City, Utah; Milwaukee, Wis.

Adolph Lewisohn, chairman of the New York Committee of the National Public Works Department Association, 61 Broadway, in announcing last night the result of the referendum, said that the Council voted in favor of the creation of a Department of Public Works "by a suitable modification of the existing Department of the Interior, excluding therefrom the non-related bureaus and offices and by change of name from Department of the Interior to Department of Public Works."

The second annual sales convention of the Greenfield Tap and Die Corporation, Greenfield, Mass., will be held at the Weldon Hotel, Greenfield, June 24, 25 and 26.

The Spafford Machine Screw Works, of 516 Asylum St., Hartford, Conn., has been recently incorporated under the name of the Hartford Machine Screw Works, Inc., and will carry on the present business of machine screw manufacturing. The capital is $330,000 and the incorporators are: Fred L. Spafford, Charles W. Cramer, C. B. Stevens and E. E. Crommitt, all of Hartford, and Claude Creighton, of White Plains, N. Y.

The Standard Equipment and Tool Works, directed by Joseph Presner, has recently taken up spacious showrooms and offices in the heart of the machinery district of Montreal, Can., at 307 St. James St.

The Chester Bertolette Co., Cincinnati, Ohio, manufacturer of punches, presses, shears and a general line of sheet-metal machinery, has moved into its new quarters at the Commercial Tribune Building, Cincinnati.

At a recent meeting of the board of directors of the Watson Stillman Co. several changes in the personnel were made, due to the retirement of A. F. Stillman from active interest in the management. E. A. Stillman remains as president of the company, and also has full supervision of the sales. Carl Wigtel, chief engineer, was elected vice president, J. D. Brocks, treasurer, and A. Parker Nevin, secretary. LeRoy T. Brown was appointed works manager, J. W. Delano, assistant works manager and W. H. Martin, purchasing agent.

The American Iron Products Co., Inc., 107 Liberty St., New York, has taken over the sole distribution in the United States of the high-speed tool steel made in Sheffield, England, by John Nicholson & Sons, Ltd. It will carry a large stock on hand.

Obituary

JOHN P. HARRINGTON, seventy-six years old, one of the founders of the Erie Forge Co., Erie, Pa., and widely known in industrial circles in this section of the state, died at his home, 940 West Sixth Street, May 27. For a number of years Mr. Harrington was superintendent of the Erie Car Works.

GEORGE E. REID, chief mechanical engineer of the Treasury Department, died at his home, 1326 Euclid St., Washington, D. C., on June 9. Mr. Reid was sixty-nine years old. He was born in Troy, N. Y., and came to Washington in 1892, entering the Government service in 1897 as assistant chief engineer of the Treasury Department.

SAMUEL FLORY, Bangor, Pa., founder and general manager of the S. Flory Manufacturing Co., died on June 10, at his home from heart disease. He was sixty-six years of age. Mr. Flory founded the S. Flory Manufacturing Co., twenty-four years ago. From a very humble beginning, he developed the industry into one of the best known manufacturing plants for mine and quarry machinery in the country.

Personals

A. H. MITCHEL and E. R. ABBOTT announce their resignation from H. W. Cotton, Inc., and their association with the Coe-Stapley Manufacturing Corporation in charge of the contract sales department with headquarters at 136 Liberty St., New York.

WILLIAM R. MARSHALL has been appointed manager of the industrial division, New York office of the Westinghouse Electric and Manufacturing Co., to succeed Harlan A. Pratt, who has resigned to become sales manager of the Atlantic Elevator Co., of New York.

ALEX HART, JR., is now manager of the tool steel department of the American Iron Products Co., Inc., New York. Mr. Hart was formerly in charge of the Detroit office of the Davidson Steel Co. He will have charge in his new position of the John Nicholson & Sons, Sheffield, England, high-speed tool steel.

MAXWELL C. MAXWELL, formerly assistant general superintendent of the Yale & Towne Mfg. Co., has been appointed to the position of general superintendent.

CARL WIGTEL, vice president and chief engineer of the Watson-Stillman Co., sailed on June 14 on the SS. "Drottningholm" of the Swedish-American Line, for a ten weeks' trip to the Scandinavian countries. He also expects to visit England, France, Belgium and Holland. While Mr. Wigtel is going mainly for a vacation, this being his first trip to his old home in Norway, since his connection with the Watson-Stillman Co., thirty-three years ago, he will also investigate new developments in the line of hydraulic machinery in all of the above countries.

FRANK L. PLATT, formerly retained by the War Department as a specialist on industrial planning projects, and later first lieutenant, 24th Engineers, A. E. F., has returned to civil life, and has become associated with the firm of Waldron & Van Winkle, consulting engineers, of New York and Boston. Mr. Platt will be in the New York office at 37 Wall St.

DOMESTIC EXPORTS FROM THE UNITED STATES BY COUNTRIES DURING APRIL, 1920
METAL-WORKING MACHINERY

Countries	Lathes 491	Other Machine Tools 492	Sharpening and Grinding Machines 493	All Other 495
Belgium	$33,712	$41,880	$5,616	$47,780
Bulgaria		2,520		
Denmark		5,434	2,773	5,202
France	157,893	267,372	45,923	308,948
Greece		334	64	
Italy	21,475	41,652	3,891	66,157
Netherlands	191	6,308	2,565	2,465
Norway	1,229	7,133	70	6,890
Portugal		2,015		
Roumania		3,436		48
Spain	22,873	34,116	8,096	20,791
Sweden		3,782	1,846	4,017
Switzerland	2,250	7,536	191	
Turkey in Europe		4,734		
England	119,568	281,138	128,559	498,294
Scotland		10,138	4,099	4,359
Ireland				1,166
Bermuda		644		
Canada	43,928	229,154	40,006	160,416
Costa Rica		306		
Guatemala		8	16	
Honduras				5,447
Nicaragua		680		1,125
Panama	1,969	363		
Salvador		41		
Mexico	8,754	13,226	4,211	9,070
Newfoundland and Labrador	552	374		640
Barbados		48		
Jamaica		26	35	800
Trinidad and Tobago		60		
Other British West Indies				50
Cuba	14,475	43,067	1,449	20,531
Virgin Islands of U. S.	29	160	66	
Dutch West Indies				173
Haiti		813		
Dominican Republic	375	769	109	
Argentina	11,145	10,109	726	13,059
Bolivia		720		
Brazil	6,752	3,713	2,361	4,133
Chile	1,462	5,392	3,864	4,327
Colombia	6,415	5,065	2,685	5,774
Ecuador	400		51	
British Guiana				21
Dutch Guiana				50
Paraguay		1,493	394	
Peru	978	4,952	505	4,011
Uruguay	675	591	83	116
Venezuela	950	139		3,800
China	19,870	17,132	5,896	20,273
Kwantung		405		
Chosen			29	3,500
British India	23,854	25,931	25	61,017
Straits Settlements	2,153		539	1,193
Dutch East Indies	11,746	3,563	960	1,940
Hongkong	1,073		78	
Japan	30,728	90,749	56,748	180,016
Siam	705			
Turkey in Asia			39	
Australia	8,415	26,688	5,463	5,164
New Zealand	2,305	4,802	2,418	3,287
Other British Oceania			55	
French Oceania				33
Philippine Islands		2,090	519	6,335
British West Africa		2,970		
British South Africa	1,109	10,207	955	7,207
French Africa		809	240	
Morocco		642	41	
Portuguese Africa		479		
Egypt		1,911		
Total	560,008	1,229,819	334,269	1,489,625

Trade Catalogs

Iron Wire. Page Steel and Wire Co., Monessen, Pa. Pamphlet, pp. 31, 4 x 6½ in. This pamphlet presents data and tables of the electrical and physical properties of American ingot iron wire.

Grinding Wheels. L. Best Co., 28-30 West Broadway, New York. Catalog, pp. 144, 6 x 9 in. This catalog contains illustrations and descriptive matter of the company's abrasive disks and cloth, grinding machinery, polishing machinery, grinding-wheel dressers, polishing supplies, abrasive grains.

Drill and Countersink Tool. Lindquist Engineering Works, Portland, Conn. A small circular illustrating its combined drill and countersink tool; list price is also given.

Science Endorses the Detroit Twist Drill. Detroit Twist Drill Co., Detroit, Mich. Some interesting facts about drilling and the performance of the Detroit twist drill are given in this bulletin.

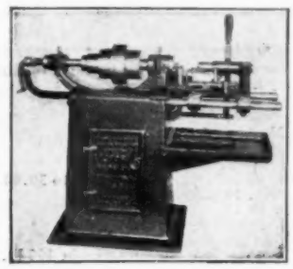
Cutter Grinders. William O. Barnes, Leominster, Mass. Booklet, pp. 7, 8½ x 11 in. An illustrated and descriptive catalog of the Barnes precision cutter grinder for grinding formed cutters, gangs of formed or plain cutters, plain cutters, shank cutters, plain or taper reamers. A list is given of the standard equipment of the Barnes No. 78 precision cutter grinder.

Flexible Shafts and Equipments. N. A. Strand Co., Chicago, Ill. Catalog, pp. 12, 3¾ x 6¾ in. This catalog describes and illustrates its various types of flexible shafts.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Facing Machine, No. 0 Nut
Victor Tool Co., Inc., Waynesboro, Pa.
"American Machinist," June 3, 1920



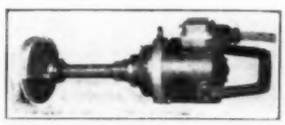
The machine holds the nut on a hardened threaded mandrel and against an equalizing collar. The carriage holding the cutters is moved forward by means of the lever shown at the right. After the nut is faced, the facing head is withdrawn by means of the lever, which also operates a friction clutch that reverses the spindle. Fingers hold the nut while the mandrel unscrews from it.

Specifications: Size of nuts handled, ¼ to ½ in. Spindle: speed, 990 r.p.m.; taper hole, No. 3, Morse; bearings, dia.: front 2¼ in., rear 1⅝ in. Floor space, 4 x 16 in. Weight with countershaft: net, 475 lb.; for domestic shipment, 525 lb.; for export, 700 lb. Measurements, boxed for export, 60 x 30 x 40 in.

Truing Tools, Diamond
Tungsten Tool Co., Inc., 110 West 42nd St., New York City
"American Machinist," June 3, 1920

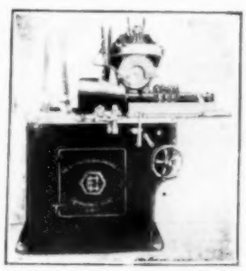
The diamonds are mounted in drill-rod nibs by a process in which no hot metal is used, thus avoiding danger to the stones from excessive heat. The nib in the center has been partly cut away and shows the diamond closely held by its matrix. It is claimed that a diamond set by this process can be of almost any size or shape and that it will be so firmly held as not to be loosened by any work it may be called upon to do, also that there is no need to reset the stone when worn down to the steel setting, the intention being to have the wheel cut away both the stone and the metal setting until the stone has been two-thirds used.

Grinder, Aerial
Van Dorn Electric Tool Co., Cleveland, Ohio
"American Machinist," June 3, 1920



The grinder has a 12-in. extension carrying the abrasive wheel well out from the frame. Power is transmitted from the armature shaft to the wheel arbor through an equalizing coupling. Ball bearings are used throughout and lubrication is by grease. End bearings are protected by felt grease-washers. The device is made with either of the following motors: d.c. ¾ hp. 110-220 volts, 4,000 r.p.m.; a.c. polyphase, ⅝ hp. 110-220 volts, 3,600 r.p.m.; a.c. single phase, ¾ hp. 110-220 volts, 3,600 r.p.m. Equipment comprises one 6 x 1 x ½-in. wheel, wheel guard, 10-ft. electric cable, attachment plug and suspension spring. Weight, 26½ to 31 lb.

Grinding Machine, Hob, Automatic
H. E. Harris Engineering Co., Bridgeport, Conn.
"American Machinist," June 10, 1920



This machine, No. 815-B, is intended for grinding hobs in sizes up to 8 in. diameter and 10 in. length and having any number of flutes up to 26. Either straight or right- or left-hand helical flutes can be ground. The indexing is entirely automatic, and the adjustment for helix angle of the work can be read to ½ min. of arc. The table travel can be operated either automatically or by hand. The feed can be set so that it will be disengaged when a predetermined amount is ground from the face of the hob. The grinding head is mounted on a circular base and can be swung in a horizontal plane. The diamond truing device does not interfere with the set-up and will true both sides and the periphery of the wheel. A coolant pump is provided.

Pointing Machine, Semi-Automatic
Kent Machine Co., Kent, Ohio
"American Machinist," June 3, 1920

The machine will point bolts or rods up to ⅜ in. diameter and of any length over 1½ in. Only one operator is required as all he has to do is to enter the work in the gripping chucks, all other operations being entirely automatic. The spindles are cam actuated and one is moving forward while the other is moving backward, allowing the operator to place work alternately in the chucks.

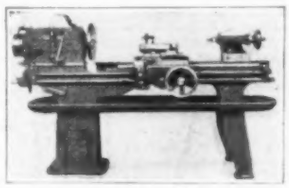
It is claimed that the machine will point bolts or rods at the rate of 50 per minute. The machine occupies a floor space of 31 x 41 in. and weighs 1,100 lb.

Vises, Drilling and Milling Machine
Hoosier Drilling Machine Co., Goshen, Ind.
"American Machinist," June 3, 1920

The jaws are faced with hardened steel, unless otherwise specified. On the bottom of the vise body a milled slot, running the entire length, has been provided for alignment when attaching the vise to the machine table. The body is also provided with slotted bolt-flanges for use in securing the vise to the table of the machine tool.

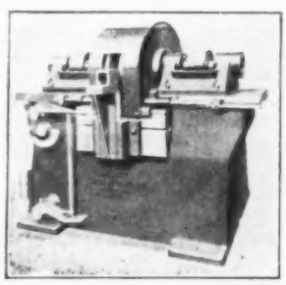
Specifications: Built in three sizes, Nos. 1, 2 and 3. Widths of jaws, 5½, 7½, 8½ in. Depths of jaws, 1½, 2 and 2½ in. Maximum opening of jaws, 3¼, 4½ and 7 in. Weights, 45, 90 and 175 lb.

Lathe, Geared Head Engine
Colchester Lathe Co., Hythe, Colchester, England
"American Machinist" (English Edition), May 15, 1920

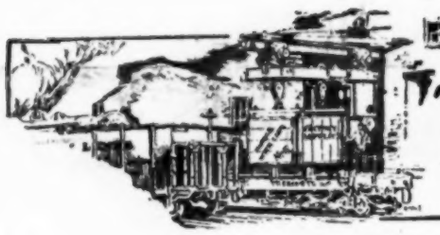


The 6½-in. center lathe with 6-ft. bed takes 3 ft. 3 in. between centers and swings over saddle 9¾ in.; in the gap 20 x 6 in. The bed, 10¼ in. wide by 7 in. deep, is braced by cross girders providing rigid construction. Eight speeds are arranged in geometric progression from 20 to 8 speeds are arranged in geometric progression from 20 to 300 r.p.m. Driving pulleys are mounted on an extension shaft which carries two pairs of sliding gears. Shafts and gears are of heat-treated steel. Spindle is of high-carbon steel bored to take 1-in. bar and runs in phosphor-bronze parallel bearings. The two clutch wheels on the spindle and the clutch give, in combination with the other gearing, 8 speeds. A 12-in. faceplate, traveling steady, etc., are provided, and the lathe weighs about 13 cwt.

Grinding Machine, Double-Spindle Disk
The Badger Tool Co., Beloit, Wis.
"American Machinist," June 10, 1920



Disk-grinding machine No. 220 is intended for finishing the two opposite parallel faces on such work as piston rings. Two 20-in. disk wheels are carried on 2⅞-in. diameter spindles mounted on radial and thrust ball bearings, and the sliding head is provided with a positive micrometer stop. Two 16-in. abrasive cylinders held in chucks are interchangeable with the disk wheels, and extra equipment can be furnished so that water may be used. The machine can be furnished equipped for either belt or motor drive. Height of spindle from floor, 38 in. Overall length, 70 in. Net weight, 4,700 lb.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$45.60	$29.80
Northern Basic	42.80	27.55
Southern Ohio No. 2	46.80	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	49.65	31.90
Southern No. 2 (Silicon 2.25 to 2.75)	49.70	33.95
BIRMINGHAM		
No. 2 Foundry	42.00@44.00	25.75
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	46@48.25*	
Virginia No. 2	45.00*	30.85
Basic	44.50†	30.90
Grey Forge	43.50*	30.90
CHICAGO		
No. 2 Foundry local	44.25	27.25
No. 2 Foundry, Southern	47.00	31.75
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	45.65	28.15
Basic	44.40	27.15
Bessemer	44.90	29.35
MONTREAL		
Silicon 2.25 to 2.75%	43.25	

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.47	$3.97	$3.47	$5.50	$3.37	$3.97	$3.47
Soft steel bars	4.62	4.12	3.37	5.00	3.27	3.87	3.37
Soft steel bar shapes	4.62	4.12	3.37		3.27	3.87	3.37
Soft steel bands	5.82	5.32	4.07	6.25			
Plates, ¼ to 1 in. thick	4.67	4.17	3.67	5.00	3.57	4.17	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.35
Warehouse, New York	4.57	3.37
Warehouse, Cleveland	3.52	3.22
Warehouse, Chicago	3.75	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Large Mill Lots	New York			
Blue Annealed	Pittsburgh	Current	One Year Ago	Cleveland	Chicago
No. 10	3.55–6.00	7.12@8.00	4.57	7.55	7.02
No. 12	3.60–6.65	7.17@8.05	4.62	7.65	7.07
No. 14	3.65–6.10	7.22@8.10	4.67	7.70	7.12
No. 16	3.75–6.20	7.32@8.20	4.77	7.80	7.22
Black					
Nos. 18 and 20	4.15–6.30	8.50@9.50	5.17	8.20	7.80
Nos. 22 and 24	4.20–6.35	8.55@9.55	5.22	8.25	7.85
No. 26	4.25–6.40	8.60@9.60	5.27	8.30	7.90
No. 28	4.35–6.50	8.70@9.70	5.37	8.40	8.00
Galvanized					
No. 10	4.70–7.50	9.75@11.00	5.50	8.50	8.15
No. 12	4.80–7.60	9.85@11.00	5.55	8.60	8.20
No. 14	4.80–7.60	9.85@11.10	5.60	8.60	8.35
Nos. 18 and 20	5.10–7.90	10.10@11.40	5.90	8.90	8.65
Nos. 22 and 24	5.25–8.02	10.25@11.55	6.05	9.05	9.05
No. 26	5.40–8.20	10.40@11.70	6.20	9.20	9.20
No. 28	5.70–8.50	10.70@12.00	6.50	9.50	9.50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.25	$5.80	$6.00
Flats, square and hexagons, per 100 lb. base	6.75	6.30	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$20.00	$25.50–30.00
Cleveland	20.00	20.00
Chicago	21.00	16.50

In coils an advance of 50c. usually is charged.

Domestic iron (Swedish analysis) is selling at 12c. per lb

WELDING MATERIAL (SWEDISH)—These prices are the best we have been able to obtain for Swedish welding materials, of which it is reported that very little are on the market.

Welding Wire		Cast-Iron Welding Rods	
5/16, 1/4, 7/32, 3/16, 5/32, No. 8, 1/8 and No. 10	21.00 to 30.00	1/16 by 12 in. long	14.00
5/64		1/8 by 19 in. long	12.00
No. 12		3/16 by 19 in. long	10.00
1/16, No. 14 and 1/16		1/4 by 24 in. long	10.00
No. 18		Special Welding Wire, Coated	
No. 20		1/8	33.00
		5/32	30.00

Domestic—Welding wire in 100-lb. lots sells as follows, f. o. b. New York: 5/32, 8½c. per lb.; 1/8, 8c.; 5/64 to 1/16, 7½c.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	6.75
Hoop steel	6.07	6.50	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.80	6.00	6.77

PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
BUTT WELD					
1/8, 1/4 and 3/8	47%	20½%	¼ to 1¼	34½%	18½%
½	51%	36½%			
¾ to 3	54%	41½%			
LAP WELD					
2	47%	34½%	2	28½%	14½%
2½ to 6	50%	37½%	2½ to 6	30½%	17½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1/8, 1/4 and 3/8	43%	25½%	¼ to ½	34½%	19½%
½	48%	35½%			
¾ to 1¼	52%	39½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	45%	33½%	2	29½%	16½%
2½ to 4	48%	36½%	2½ to 4	31½%	19½%
4½ to 6	47%	35½%	4½ to 6	30½%	18½%

Stock discounts in cities named are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
¼ to 3 in. steel butt welded	40%	24%	40%	31%	54@40%	40½@30%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	50@40%	37½@27½%

Malleable fittings, Class B and C, banded, from New York stock sell at plus 32%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	18.00	19.25	18.00
Tin in 5-ton lots	46.25	61.50	72.50
Lead	8.00	9.00	5.35
Spelter	7.87½	8.70	6.85
ST. LOUIS			
Lead	7.75	8.87½	5.10
Spelter	7.50	8.37½	6.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

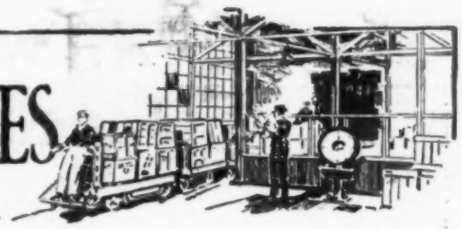
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago April 8 Current	Chicago April 8 Year Ago
Copper sheets, base	33.50	29.50	26.00	32.00	26.50	36.00	27.00
Copper wire (carload lots)	31.25	31.25	24.00	29.50	26.50	27.00	23.00
Brass sheets	28.50	27.50	20.50	29.00	25.00	27.00	21.50
Brass pipe	33.00	32.00	30.75	34.00	33.00	35.00	31.00
Solder (half and half) (case lots)	33.00	39.00	38.00	40.50	41.00	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	18.00
New York	25.00	19.50
Cleveland	27.00	24.00
Chicago	26.00	24.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 12.50

	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	12.95	15.50	13.30
New York	14.00	12.00	14.50	13.00
Chicago	15.00	16.50	15.00	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	8.00	8.50
Chicago	11.50	10.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	16.00	15.00	16.50	16.00
Copper, heavy, and wire	15.25	14.00	16.50	15.00
Copper, light, and bottoms	13.75	12.00	15.00	14.00
Lead, heavy	7.00	4.62½	7.00	7.00
Lead, tea	5.00	3.75	5.00	6.00
Brass, heavy	10.25	8.75	12.50	16.50
Brass, light	7.50	7.00	10.00	10.00
No. 1 yellow brass turnings	8.50	8.50	10.00	10.00
Zinc	5.25	4.25	5.00	6.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	25.00
Chicago	29.00	28.00
Cleveland	32.00	28.50

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	74.50	79.00	70.00	75.00
Commercial	50.00	42.00	21.50	17.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+$4.00	3.25	$ .75	$1.90	$.50	2.00
Hot pressed hexagon	+ 4.00	2.70	.75	1.90	.50	2.00
Cold punched hexagon	+ 4.00	3.25	.75	1.90	.50	1.30
Cold punched square	+ 4.00	2.70	.75	1.90	.50	1.30

Semi-finished nuts, ⅝ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50–10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	List	40%	30%
Larger and longer up to 1½ in. by 30 in.	+20%	20–10%	20%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York ..... list Cleveland ..... $3.00 Chicago $3.00

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York ..... $7.00 Cleveland ..... $4.50 Chicago $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	10%	35%	20%
Larger and longer up to 1 in. by 30 in.	10%	20%	15%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	25%	10%	10%
Chicago	10%	10%	10%	10%
New York	25%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅛ and smaller	30%	40%	35–10%
Tinned	30%	40%	35–10%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York ..... $7.00 Chicago ..... $5.37 Pittsburgh $4.72

Structural, same sizes:

New York ..... $7.10 Chicago ..... $5.47 Pittsburgh $4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	34.00	34.00	35.00
Brass	33.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; les than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $8.50 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
White	11.00@15.50	13.00	16.00	11.00 to 14.00
Colored mixed	7.00@10.50	9.00–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.00	$2.25	$1.75
Philadelphia	2.75	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.50	2.25	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.90	$4.00	$3.65
Philadelphia	3.65		
Cleveland	4.25	4.25	3.62
Chicago	5.00	5.00	5.00

COKE—The following are prices per net ton at ovens, Connellsville:

	June 10	June 3	May 27
Prompt furnace	$14.50@$15.00	$14.50@$15.50	$14.50@$15.50
Prompt foundry	15.50@16.00	15.50@16.50	15.50@16.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

	— New York —		Cleveland	— Chicago —	
	Current	One Year Ago		Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.70	$1.90	$2.02	$2.02	$2.10
5-gal. cans (without cans)	1.73*	2.03	2.27	2.27	2.30

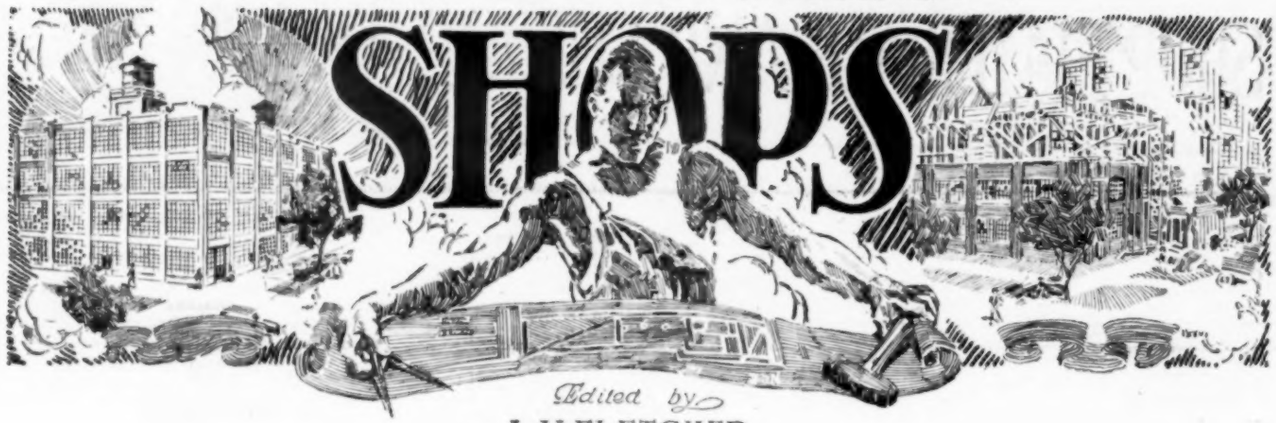
*To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEAD—Base price per pound:

	— Red —				— White —	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW and ENLARGED



Edited by
L·V·FLETCHER

Machine Tools

The following concerns are in the market for machine tools:

Mass., Boston—G. Marsh, c/o Tuck & Gilman, 34 School St.—garage equipment.

N. J., East Orange—The Simms Magneto Co., 279 Halsey St.—nine external grinders.

N. J., Jersey City—The Torsion Balance Co., 47 8th St.—one ⅝ in. screw machine.

N. J., Newark—The Brooks Ostrub Co., 225 West 66th St.—presses for work on automobile bodies.

N. Y., Buffalo—The Newman Mchy. Sales Co.—
One universal planer grinder.
One 24 in. x 24 ft. lathe.
One 30 in. x 10 or 12 ft. lathe.
One 48 in. x 10 or 12 ft. lathe (all new).

N. Y., Jamestown—The Crescent Tool Co., 200 Harrison St.—machine tools for forge shop.

N. Y., New York (Borough of Brooklyn)—The Brooklyn Commercial Body Co., 470 Clermont Ave.—power rotary shears, power beading machine and power rolling machine for automobile fender work.

N. Y., New York (Borough of Brooklyn) The Hopewell Insulation and Mfg. Co., 555 Eastern Parkway—machine tool equipment.

N. Y., New York (Borough of Brooklyn)—L. Weiss, 286 Taaffe Pl.—drill presses.

N. Y., New York (Borough of Manhattan)—The Ajax Fastener Co., 145 West 28th St.—ten power presses, 1 and 1½ in. stroke, V. & O. or lighter preferred.

N. Y., New York (Borough of Manhattan)—The Bureau Technique Francais, Inc., Woolworth Bldg.—one belt driven heading, upsetting and forging machine, capable of making square and hexagon head bolts and conical, oval and countersunk rivets ranging from ⅜ to 1¼ in., complete with countershaft, double clutch stop motion, side shear, vertical automatic relief device and wrenches.

N. Y., New York (Borough of Manhattan)—The W. M. Crane Co., 16 West 32nd St.—machine tool equipment for manufacture of gas appliances.

N. Y., New York (Borough of Manhattan)—J. Dunn Son & Co., 44 Whitall St.—all types of lathes for export.

N. Y., New York (Borough of Manhattan)—The Fox Film Co., 10th Ave. and 55th St.—lathes for laboratory at Fort Lee, N. J.

N. Y., New York (Borough of Manhattan)—The Nicholas Power Co., 90 Gold St.—lathes, screw machines, drill presses and punch presses for work on moving picture machines.

N. Y., New York (Borough of Manhattan)—The Precision Machine Co., 317 East 34th St.—one ⅝ in. screw machine.

N. Y., New York (Borough of Manhattan)—Viele, Blackwell & Buck, 49 Wall St.—punches and shears.

N. Y., Schenectady—The General Electric Co., River Rd., A. R. Howgate, Purch. Agt.—for Harrison, N. J., plant—one engine lathe with 18-in. swing; for Bridgeport, Conn., plant—one 36-in. x 36-in. x 8-ft. planer arranged with reversed motor drive, with two heads on cross rail and one on side rail.

Pa., Philadelphia—The Keystone Supply and Mfg. Co., 927 North 9th St.—garage equipment.

Pa., Pittsburgh—The Gearless Motor Corp., Arrott Bldg.—one double crank press.

Pa., Pittsburgh—The Witherow Steel Co., Keystone Bldg.—one lathe with 18-in. roll.

Pa., Spring City—The Schuylkill Valley Mills, Inc.—machine tools for shop.

Ky., Highland Park—The Louisville Axe and Tool Co.—one 13-in. x 6 or 8-ft. standard screw cutting lathe, cone driven, compound rest, with or without taper attachment (used).

Va., Roanoke—The Norfolk and Western R.R., J. H. Clemmitt, Purch. Agt.—
One 48 in. x 48 in. x 12 ft. planer, motor driven, 230 v., d.c.
One No. 17 disk grinder for pattern work, motor driven, 220 v., a.c., 3 ph., 60 cycle.
One No. 25 Oliver motor head pattern-maker's lathe.
One 4 spindle staybolt threading machine, similar to Lassiter, motor driven, 230 v., d.c., push button control.
One double end combined punch and shear with removable head for either punching or shearing, to have 24-in. throat and capacity of 1⅛ in. hole through 1 in. steel plate, and to shear 1 x 8-in. bars, motor driven, 220 v., a.c., 3 ph., 60 cycle.

W. Va., Warwood (Wheeling P. O.)—The Globe Automatic Sprinkler Co.—one press (used).

Ill., Chicago—The J. H. Boyle Mfg. Co., 412 Orleans St.—one Hutchinson staple machine.

Ill., Chicago—The Chicago, Rock Island & Pacific R.R., F. D. Reed, 350 Normal Parkway, Purch. Agt.—two No. 3 Rockford armature balancing machines (new).

Ill., La Salle—The Apollo Metal Wks.—
One power rotary shear.
One power forming machine with 3-in. roll.
One power bending machine with 13-in. throat.
One power seaming and turning machine.
One power wiring and double seaming machine (all for 16 gage sheets new or used).

Ind., Hammond—The Overland Crane Co.—wood and metal turning machinery, millers, punches, drills and gear cutters.

Mich., Detroit—The Hayes Mchy. Co., 42 East Larned St., A Sprague, Secy.
One No. 55 and one No. 56 Toledo geared press with strokes 4 to 6 in., or equivalent.
One 3,000 to 3,500-lb. board drop hammer.
One 1,500-lb., one 2,000-lb. and one 2,500-lb. steam drop hammer.

Mich., Detroit—The Vulcan Axle Co., Beecher Ave., A. Weaver, Purch. Agt.—drill presses, low-slung lathes and general equipment for machining axles.

O., Cincinnati—The Newman Mfg. Co., 717 Sycamore St.—one No. 2 milling machine.

Wis., Milwaukee—The Bradley Mfg. Co., 373 Bway.—one 48-in. boring mill (used).

Wis., Milwaukee—The F. Luenzmann Co., 1912 Prairie St., C. Luenzmann, Purch. Agt.—one 2 spindle shaper, one 2 side planer, one tenon machine, one 48-in. sander and one chain mortiser.

Wis., Milwaukee—The Master Seeder Co., 807 12th St., V. H. Glanz, Purch. Agt.—lathes, drills, etc., for manufacture of seeders.

Wis., Milwaukee—The Meigs Powell Co., 522 16th Ave., A. Gulpe, Purch. Agt.—one No. 2 milling machine, Kempsmith or Rockford preferred.

Wis., Milwaukee—The Petit Mfg. Co., c/o D. W. Petit, 270 Prospect Ave.—one shaper, one planer, one lathe and one grinder.

Wis., Milwaukee—C. A. Zaiser 671 Kinnikinnic Ave.—one shaper and one drill press.

Wis., Oconomowoc—Fabry & O'Brien—one small lathe and welding outfit.

Wis., West Allis—The Fulton Co., 732 75th Ave., S. A. Fulton, Purch. Agt.—one 14-in. drill press and one bench press.

Kan., Hutchinson—The Hutchinson Egg Case Filler Co.—one universal tool and cutter grinder, No. 1, Wilmarth & Norman or similar (new or used).

Ont., Galt—The Elliott & Whitehall Machine and Tool Co., Ltd.—milling and slotting and shaping machines.

Ont., St. Catherine—The McKinnon Industries, Ltd.—one belt driven trimming press, 36 in. between housings, stroke at least 4 in., with side cut-out, dimensions similar to No. 93 Toledo.

Que., Shawnengan Falls—The Belgo Canadian Paper Co.—one grinder, magazine type, and two paper machines.

Machinery

The following concerns are in the market for machinery:

R. I., Providence—The Natl. Collapsible Tube Co.—lithographing equipment.

N. J., Trenton—The Bergougnan Rubber Corp., East State St., H. Coleman, Pres.—$60,000 worth of machinery.

Md., Indianhead—The Natl. Proving Ground—
One band saw with 42-in. diameter.
One column scroll saw.
One patternmaking lathe.
One arm sandpapering machine.
One patent core box machine.
One automatic band saw grinder.
All motor driven.

N. Y., New York (Borough of Manhattan)—The J. G. White Eng. Co., 43 Exch. Pl.—one 5 ton overhead traveling crane with 26-ft. 6-in. span, for the Nicholas Copper Co., Laurel Hill, L. I.

N. Y., New York (Borough of Queens)—The Atlantic Macaroni Co., 295 Vernon St., Long Island City—machinery for manufacture of macaroni.

Pa., Bethlehem—The Redington Standard Fittings Co.—one double-end emery grinder for 18-in. wheel, motor driven, 550 v., 3 ph., 25 cycle, similar to machine shown on page 1262 of American Machinist for June 10th.

Pa., Chester—The Amer. Locomotive Co., Delaware and Jeffrey Sts.—eight electric hoists.

Pa., Eddystone (Chester P. O.)—The Baldwin Locomotive Co.—18 overhead traveling cranes of small capacity.

Pa., Pottstown—The U. S. Axle Co.—one 6-ft. x 30 or 36-in. plane cylindrical grinder.

Ga., Atlanta—The Shearer Machine Co., 197 Whitehall St.—machinery for enlarged shops.

Tenn., Memphis—The Memphis Steel and Iron Wks., J. E. Conley, 467 Simpson Ave., Pres.—machinery for rolling mill.

Va., Richmond—The Gould Fire Prevention Products Co., 215 Travelers Bldg., W. D. Turner, Purch. Agt.—full equipment for manufacture of oil, lead and zinc paints.

Ill., Chicago—The Chicago Mail Order Co., 2511 Indiana Ave., W., R. B. Anthony, Purch. Agt.—one electric driven baler, capacity 100 lb. (new or used).

Mich., Detroit—The Machon Pattern & Mfg. Co., 231 16th St.—machine equipment for manufacture of patterns.

Mich., Detroit—Olson & Drake, 1853 3d St., A. C. Drake, Purch. Agt.—six or more 24-in. jackscrews.

Mich., Grand Rapids—The Oliver Mchy. Co., Clancy and Coldbrook Sts.—foundry equipment.

O., Willoughby—The Zenith Tire and Rubber Co., 450 Leader-News Bldg.—machinery for the manufacture of rubber.

Wis., Madison—W. Brueske, East Washington Ave. and North St.—one portable floor crane for garage.

Wis., Milwaukee—The Badger Metal Ware Co., 313 Milwaukee St.—equipment for manufacture of cooking utensils and wash boilers.

Wis., Milwaukee—The J. C. Becker Co., 376 Bway.—one cabinetworker's bench complete.

Wis., Milwaukee—The Clark Motor Co., 460 Jackson St., L. Christopher, Purch. Agt.—one hand-power crane.

Wis., Milwaukee—The Improved Trolley Co., 602 Security Bldg., J. H. Cunningham, Purch. Agt.—machinery for manufacture of trolley for street cars.

Wis., Milwaukee—The Modern Builders, R. J. Van Nostrand, 209 Grand Ave., Purch. Agt.—one sticker and one sander.

Wis., Milwaukee—The Modern Portable Co., 449 7th Ave.—woodworking machinery.

Wis., Racine—The Splitex Auto Radiator Co., 401 Lake St.—machinery for the manufacture of radiators.

Wis., West Allis—J. M. Manning, 636 61st Ave.—one or more machines for manufacture of ice cream sandwiches.

Minn., Duluth—Cowen & Zimmerman, 531 East Superior St., F. L. Cowen, Purch. Agt.—woodworking machinery including lathes, small planers, sawing machines, etc.

Minn., St. Paul—The Marquette Mfg. Co., 616 Endicott Bldg.—equipment for manufacture of patent automobile tire tool.

Mo., Bowling Green—H. Christy, Box 396—woodturning machinery for turning pipe.

Wash., Rosling—The Greys River Shingle Co.—one wood planer.

Sweden, Tristinehamn—S. Malmberg—machines for manufacture of nuts by the hot process.

Metal Working

NEW ENGLAND STATES

Mass., Boston—L. K. Alintuck, c/o Tuck & Gilman, Archts., 34 School St., has awarded the contract for the construction of a 2 story, 75 x 200 ft. garage on Fordham Rd. Estimated cost, $165,000. Noted June 10.

Mass., Boston—G. Marsh, c/o Tuck & Gilman, Archts., 34 School St., has awarded the contract for the construction of a 2 story, 100 x 145 ft. garage on Brighton Ave. Estimated cost, $125,000. Noted April 27.

Mass., Lynn—The General Electric Co., 84 State St., will soon award the contract for the construction of a 1 story manufacturing addition to its plant. Estimated cost, $100,000.

Mass., Worcester—M. N. Ullman, 50 Water St., is having plans prepared by E. T. Chapin, Archt., 340 Main St., for the construction of a 1 story, 70 x 95 ft. garage on School St. Estimated cost, $45,000.

Mass., Springfield—C. A. Nash, 120 Oakland St., has awarded the contract for the construction of a 2 story, 50 x 140 ft. garage. Estimated cost, $70,000.

MIDDLE ATLANTIC STATES

Del., Wilmington—The Automobile Supply Co., c/o Greisler & Abramson, Archts. and Engrs., Lafayette Bldg., Philadelphia, has awarded the contract for the construction of a 3 story, 40 x 70 ft. garage on 12th and French Sts., here. Estimated cost, $50,000.

Md., Baltimore—A. F. Goetz, Jr., 1759 Montpelier St., has awarded the contract for the construction of a 1 story, 20 x 123 ft. garage and 40 x 78 ft. warehouse at 1902 East Hoffman St. Estimated cost, $30,000.

N. J., East Orange—F. Stoniere, 773 South 20th St., Newark, is having plans prepared by M. B. Silberstein, Archt., 121 Springfield Ave., Newark, for the construction of a 1 story, 75 x 110 ft. garage at 993 South Orange Ave., here. Estimated cost, $20,000.

N. J., Trenton—The J. E. Thropp Sons Co., Fair St., has awarded the contract for the construction of a 1 story, 60 x 150 ft. foundry. Estimated cost, $36,000.

N. Y., New York (Borough of Bronx)—Robertson & Gammies, 390 Wadsworth Ave., are building a 1 story garage on 137th St. and Southern Blvd. Estimated cost, $40,000.

N. Y., New York (Borough of Bronx)—F. Tefano, 890 Bryant Ave., will build a 2 story, 75 x 100 ft. garage on Longfellow Ave. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—The G. E. Brown Mortgage Corp., 26 Court St., will build a 1 story, 50 x 350 ft. garage on Utica and Atlantic Aves. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—S. Coons, 44 Court St., will build a 1 story, 110 x 140 ft. garage on Parkside Ave. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—The Verdune Improvement Co., 1416 Lincoln Pl., will build a 1 story garage on 60th St. and Ft. Hamilton Ave. Estimated cost, $40,000.

Pa., Philadelphia—The Keystone Supply and Mfg. Co., 927 North 9th St., will soon award the contract for the construction of a garage at 811 Poplar St. Estimated cost, $10,000. F. E. Hahn, 1112 Chestnut St., Archt. and Engr.

SOUTHERN STATES

Ga., Rome—The International Steel and Motors Corp., recently incorporated with $20,000,000 capital stock, plans to build a plant to include a blast furnace of 60 tons daily capacity, an open hearth furnace with blooming mill for making hard and soft billets with an annual capacity of 200,000 tons, and a bar and shapes mill. H. A. Dean, 314 2nd Ave., Vice-Pres.

Tenn., Memphis—The Memphis Steel and Iron Wks. plans to build a 1 story rolling mill in the northern section of the city. Estimated cost, $300,000. J. E. Conley, 467 Simpson Ave., Pres.

Tenn., Nashville—The St. Bernard Mining Co., Arcade St., has awarded the contract for the construction of a 2 story, 65 x 130 ft. work shop addition to its plant on Ewing St. Estimated cost, $25,000.

MIDDLE WEST

Ind., Ft. Wayne—The General Electric Co., Bway., has awarded the contract for the construction of a 2 and 3 story, 150 x 300 ft. factory on Winter St. for the manufacture of lamps. Estimated cost, $400,000.

Ind., Hammond—The Overland Crane Co. is building a factory.

Ind., Indianapolis—The Ed. Educ. plans to build a shop at the Arsenal Technical High School. Estimated cost, $150,000.

Ind., Muncie—The Sheridan Motors Co. plans to build a large factory.

Mich., Caro—Cooper & Striffler will soon award the contract for the construction of a 1 story, 79 x 133 ft. garage and repair shop. Estimated cost, $40,000. Cowles & Mutscheller, Chase Blk. Saginaw, Archts.

Mich., Detroit—The A. Colton Co., 782 Jefferson Ave., has awarded the contract for the construction of a 3 story, 60 x 100 ft. factory for the manufacture of pharmaceutical equipment and special machinery. Estimated cost, $50,000. Noted May 20.

Mich., Detroit—The Federal Motor Truck Co., Federal Ave., is having preliminary plans prepared by F. J. Winter, Archt., 2331 Dime Bank Bldg., for the construction of a factory along the tracks of the Detroit Terminal Ry. Estimated cost, $200,000.

Mich., Detroit—The Jefferson Forge Products Co., Jefferson Ave. and Connors Corner, has awarded the contract for the construction of a 1 story, 40 x 120 ft. forge shop on Jefferson Ave. Estimated cost, $20,000.

Mich., Flint—The Perkins Structural Steel Co., Wooster, O., plans to build a plant here.

Mich., Grand Rapids—The Oliver Mchy. Co., Clancy and Coldbrook Sts., plans to build a 1 story addition to its foundry. Estimated cost, including equipment, $50,000. The H. M. Lane Co., 701 Owen Bldg., Detroit, Mich., Engrs.

O., Cincinnati—The King Machine Tool Co., Clifton Ave. along the tracks of the Baltimore & Ohio Southwestern R.R., has awarded the contract for the construction of a 1 story machine shop, to have 30,000 sq.ft. of floor space. Estimated cost, $70,000.

O., Cincinnati—The Wagner Repair Shop is having plans prepared by J. R. and W. R. Stewart, Archts., 519 Main St., for the construction of a 2 story, 50 x 90 ft. machine shop on 13th and Hunt Sts. Estimated cost, $25,000.

O., Huron—The Universal Steel Co., 408 Schofield Bldg., Cleveland, is preparing plans for the construction of a mill here for the manufacture of tubes and conduits. Estimated cost, $300,000.

O., Mansfield—The Ideal Electric and Mfg. Co. has awarded the contract for the construction of a 1 story, 160 x 450 ft. and 100 x 450 ft. factory and office building. Estimated cost, $350,000.

O., Warren—The Frost Superior Fence Co., East 131st St., Cleveland, has awarded the contract for the construction of a 1 story, 60 x 220 ft. factory on Kinsman Tract, here. Estimated cost, $100,000.

Wis., Appleton—The Appleton Wire Wks., Atlantic St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. addition to its factory. Estimated cost, $25,000.

Wis., Beaver Dam—The Ft. Rassman Mfg. Co. plans to build a 1 story, 60 x 120 ft. moulding foundry addition to its plant on Main St.

Wis., Milwaukee—The Petit Mfg. Co., c/o D. W. Petit, 270 Prospect Ave., has awarded the contract for the construction of a 1 story, 60 x 120 ft. machine shop on Buffum St. Estimated cost, $30,000.

Wis., Racine—The Nelson Bros. and Strom Co., 1109 6th St., will soon award the contract for the construction of a 1 story, 37 x 110 ft. garage. D. R. Davis Schultz Bldg., Archt.

Wis., Racine—The Splitex Auto Radiator Co., 401 Lake Ave., has awarded the contract for the construction of a 1 story, 80 x 125 ft. factory on Thurston St.

WEST OF THE MISSISSIPPI

Ia., Des Moines—The Des Moines Fdry. and Machine Co., 314 Flynn Bldg., has awarded the contract for the construction of a 1 story, 130 x 220 ft. foundry and machine shop on 16th St. and Wabash Ave. Estimated cost, $350,000.

Mo., Kansas City—The Fortified Mfg. Co., 14th and Agnes Sts., is having plans prepared for the construction of a 2 story addition to its plant for the manufacture of electrical heating devices.

Mo., St. Louis—The Majestic Mfg. Co., 2014 Morgan St., will soon award the contract for altering its 2 story factory for the manufacture of ranges, etc. Estimated cost, $30,000. J. H. Lynch & Son, Dolph Bldg., Archts. and Engrs.

Neb., Grand Island—Tieter & Homair will soon award the contract for the construction of a 4 story, 66 x 132 ft. garage and service station on Main St. Estimated cost, $80,000. G. W. Graves, 43 John R. St., Detroit, Archt. Noted April 8.

WESTERN STATES

Cal., Stockton—The Bd. of Supervisors of San Joaquin County is having plans prepared by Wright & Satterlee, Archts., for the construction of an agricultural park, to include a 100 x 200 ft. machinery hall, a 200 x 300 ft. automobile exhibit building, etc. Estimated cost, $1,000,000.

Wash., Spokane—The Overland Co., 1229 1st Ave., has awarded the contract for the construction of a 3 story, 70 x 150 ft. garage, on Sprague and Medicine Sts. Estimated cost, $100,000.

CANADA

Ont., Galt—The Elliott & Whitehall Machine and Tool Co., Ltd., will build a 50 x 200 ft. factory. Estimated cost, $40,000.

Que., Montreal — The Phillips Electrical Co., Craig St., W., has awarded the contract for the construction of a 2 story, 40 x 60 ft. factory, on Henri Julien St., for the manufacture of electrical goods. Estimated cost, $24,000.

General Manufacturing

NEW ENGLAND STATES

Mass., Rockland—The Rockland Webbing Co., Park St., is having plans prepared by Tuck & Gilman, Archts., 34 School St., Boston, for the construction of a 2 story, 50 x 75 ft. addition to its plant. Estimated cost, $25,000.

R. I., Providence—The Natl. Collapsible Tube Co. has had plans prepared for the construction of a 1 story, 50 x 75 ft. addition to its plant on Carpenter St.

MIDDLE ATLANTIC STATES

Md., Baltimore—The La Motte Chemical Products Co., 13 West Saratoga St., is preparing plans for the construction of two 1 story laboratories, to have 6,700 sq.ft. of floor space. F. L. La Motte, Pres.

Md., Baltimore—Levenson & Zenitz, Inc., 10-12 North Frederick St., has had plans prepared by J. Freund, Archt., 1307 St. Paul St., for the construction of a 4 story, 34 x 58 ft. warehouse and factory, for the manufacture of furniture. Estimated cost, $100,000.

Md., Baltimore—The Presto-Lite Co., Inc., 30 East 42nd St., will soon award the contract for the construction of an acetylene plant, to consist of 8 one story buildings, averaging 25 x 50 ft. Estimated cost, $75,000.

N. J., Newark—The Clark Thread Co., Clark and Ogden Sts., will soon award the contract for the construction of a 4 and 5 story, 82 x 300 ft. and 60 x 200 ft. addition to its factory on Gouverneur and Passaic Sts.

N. J., Newark—M. Hertz, 68 Oliver St., has awarded the contract for the construction of a 1 story addition to his factory at 74 Oliver St. Estimated cost, $20,000.

N. Y., Albany—J. L. Kinney, 234 Clinton Ave., has awarded the contract for the construction of a 2 story, 80 x 85 ft. bakery at 255-261 Dove St. Estimated cost, $60,000. Noted April 22.

N. Y., Buffalo—The Jacob Dold Packing Co., 745 William St., has prepared plans for the construction of a 3 story addition to its tank house and fertilizer building. Estimated cost, $250,000.

N. Y., New York (Borough of Queens)—R. M. Krauser, c/o C. Bauer, Archt. and Engr., 788 Manhattan Ave., Brooklyn, is having plans prepared for the construction of a 3 story, 60 x 100 ft. factory on 129th St., Richmond Hill, for the manufacture of gold seals. Estimated cost, $80,000.

N. Y., Niagara Falls—The Carborundum Co., Buffalo Ave. and 18th St., has had plans prepared for the reconstruction of its plant which was recently damaged by fire. Estimated cost, $50,000.

Pa., Philadelphia—The Curtis Publishing Co., Independence Sq., has awarded the contract for the construction of an additional story to its plant. Estimated cost, $600,000.

Pa., Philadelphia—The G. H. P. Cigar Co., 21 North 2nd St., will soon award the contract for altering its 6 story, 85 x 100 ft. factory. A. J. Sauer Co., Denckla Bldg., Engr. and Archt. Noted June 17.

Pa., Philadelphia—The Surpass Leather Co., 9th and Westmoreland Sts., has awarded the contract for the construction of a 1 story, 40 x 50 ft. addition to its factory on 19th and Ontario Sts. Estimated cost, $10,000.

Pa., Pittsburgh—The Presto-Lite Co., 30 East 42nd St., New York City, will soon award the contract for the construction of a 1 and 2 story acetylene plant to include a 30 x 36 ft. compressor building, a 30 x 84 ft. purifier and drier building, a 24 x 26 ft. garage, a 30 x 90 ft. charging building, a 12 x 16 ft. cylinder repair building, a 16 x 24 ft. oil trap building, a 15 x 33 ft. addition to its boiler house and an addition to its generator and compressor building. Estimated cost, $100,000.

SOUTHERN STATES

Fla., Jacksonville—The Wilson & Toomer Fertilizer Co., Viaduct St., has had plans prepared for the construction of a fertilizer factory. Estimated cost, $75,000.

La., Hammond—The Mayo Products Co. is preparing preliminary plans for the construction of a 3 story, 50 x 175 ft. canning plant. Estimated cost, $25,000. J. L. Davis, Kentwood, Engr.

Ky., Newport — O. Zimmerman & Sons, 5th and Sycamore Aves., Cincinnati, have awarded the contract for the construction of a 2 story, 80 x 150 ft. printing plant at 120 East 3rd Ave., here. Estimated cost, $100,000.

Va., Richmond — The Virginia Carolina Rubber Co., Real Estate Exch. Bldg., will build the first unit of its plant, 50 x 240 ft., for the manufacture of automobile tires, etc. Estimated cost, $15,000.

MIDDLE WEST

Mich., Saginaw—The Aero Cushion Inner Tire and Rubber Co., 909 Ford Bldg., has awarded the contract for the construction of a 2 story, 80 x 200 ft. factory. Estimated cost, $75,000.

O., Cincinnati—The Lunkenheimer Co., Beekman and Tremont Sts., has awarded the contract for the construction of a 1 story, 350 x 400 ft. laundry on Carthage St. Estimated cost, $100,000.

O., Cincinnati—The J. F. Schrath Co., Township and Cormany Sts., has awarded the contract for the construction of a 1 story, 50 x 100 ft. addition to its packing house. Estimated cost, $10,000.

O., Cleveland—The J. Boehm Cabinet Co., 6209 Sargent Ave., has awarded the contract for the construction of a 1 story, 51 x 57 ft. factory at 2216 West 63rd St. Estimated cost, $10,000.

O., Cleveland—The Strong Cobb Co., East End, Central Viaduct, manufacturer of drugs, plans to build a 2 story factory. Estimated cost, $150,000. F. T. Strong, Secy.

O., Ravenna — The McElrath Tire and Rubber Co., 1836 Euclid Ave., is building a 3 story, 30 x 50 and 100 x 300 ft. factory and boiler house. Estimated cost, $125,000. Noted May 13.

O., Willoughby — The Zenith Tire and Rubber Co., 450 Leader-News Bldg., has awarded the contract for the construction of a 3 story, 100 x 620 ft. factory, a 1 story, 64 x 160 ft. warehouse and a 3 story, 50 x 100 ft. office building on Main St. Estimated cost, $750,000. M. Metzger, Pres.

Wis., Cornell—The Cornell Wood Products Co. has awarded the contract for the construction of a 2 story, 88 x 300 ft. factory for the manufacture of paper. Estimated cost, $1,000,000.

WESTERN STATES

Cal., Oakdale — The Oakdale Almond Growers Assn. has awarded the contract for the construction of a 1 story packing house. Estimated cost, $45,000.

Cal., San Francisco—The Angeles Candy Co., 1155 Mission St., is having plans prepared by W. L. Schmolle, Archt., 40 Montgomery St., for the construction of a 3 story candy factory on 3rd and Bryant Sts. Estimated cost, $100,000.

Wash., Rosling — The Grays River Shingle Co. will build a 40 x 60 ft. factory. Estimated cost, $8,000. T. Swanson, Mgr.

CANADA

Ont., London—The Scott Chamberlain Co. Richmond St., is having plans prepared by W. G. Murray, Archt., Dominion Saving Bldg., for the construction of a 3 story, 40 x 80 ft. shoe factory. Estimated cost, $35,000.

Que., Montreal—The Canadian Consolidated Rubber Co., Ltd., 201 Inspector St., has awarded the contract for the construction of a 100 x 150 ft. factory on Guy and St. James Sts. Estimated cost, $100,000.

Que., Montreal—The T. Davidson Mfg. Co., Vine St., manufacturer of enameled goods, has awarded the contract for the construction of a 1 story, 55 x 124 ft. addition to its factory on the north banks of the Canal near Marble. Estimated cost, $20,000.

Que., Montreal—W. Lowney & Co., 169 William St., has awarded the contract for the construction of a 1 story, 32 x 68 ft. addition to its factory for the manufacture of chocolate. Estimated cost, $25,000.

Que., Montreal—P. Patigraw, 835 Henri Julien St., will soon award the contract for the construction of a 3 story, 15 x 63 ft. factory for the manufacture of shoes. Estimated cost, $15,000.

Que., Montreal—J. M. Singer, Craig St., has awarded the contract for the construction of a 3 story, 50 x 65 ft. factory on Marie Anne St., for the manufacture of shoes. Estimated cost, $44,000.

News of Opportunities

The latest opportunities being offered in the machinery field will be found in the

SEARCHLIGHT SECTION

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Business Opportunities
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Agents and Salesmen
Machinery Wanted
Surplus Machinery
Positions Wanted
Miscellaneous Wants

CONSULT IT NOW—EVERY WEEK. ***See Pages 293 to 327***

For Every Business Want—"*Think* SEARCHLIGHT *First*"

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CONTENTS

A Real School Shop for Boys 1335
By Fred H. Colvin
An interesting account of the apprentice school which is in force in the plant of the Ford Motor Co.
"American Machinist," Vol. 52.

How Do You Regulate Materials?—I 1338
By Henry H. Farquhar
A discussion of the problem of replenishment of materials as related to production and good management.
"American Machinist," Vol. 52.

Care of Cast-Iron Straightedges 1341
By E. A. Dixie.
How straightedges should be made and cared for to secure and preserve their accuracy.
"American Machinist," Vol. 52.

Modern Welding and Cutting—XXII 1343
By Ethan Viall.
In this article directions are given to the beginner as to how to use the torch and cut metal.
"American Machinist," Vol. 52.

Nichrome: A Heat-Resisting Alloy 1347
Editorial Correspondence.
A description of the manufacture and use of this new high-temperature metal.
"American Machinist," Vol. 52.

The Manufacture of Household Appliances—III 1349
By J. V. Hunter.
The manufacture of parts for the Thor washing machines is here described; the machines and the methods used to facilitate speedy production are well covered.
"American Machinist," Vol. 52.

A Special Fixture for Milling Rails for Automobile Frames 1353
By R. A. Wilson.
This article tells how a standard machine, by the use of a special fixture, was adapted to large scale production work upon one part of an automobile frame.
"American Machinist," Vol. 52.

Practical Methods of Appraisal 1355
By L. L. Thwing.
In this article the author gives the results of his experiences in the appraisal of used machine tools.
"American Machinist," Vol. 52.

The Employees Magazine and Safety First 1358
By John T. Bartlett.

Automotive Construction—Machining the Liberty Crankcase—II 1361
This installment covers the methods used in drilling the holes for the oil tubes, which is particularly interesting on account of the Liberty being a "dry" type of case.
"American Machinist," Vol. 52.

Searchlight Section 293
Contract Work 328

Please read and pass on to	Page

Editorial—The Spirit of the Federation 1366
"American Machinist," Vol. 52.

Ideas from Practical Men 1367
Method of Hardening Long Small Wires, Stotz—A Simple Expanding Mandrel, Kurzweil — A Double-Action Clamp, Belmont.
"American Machinist," Vol. 52.

Editorials 1368
The Value of High-Altitude Flying—Countersigns and Jobs—Mechanics of the Future.
"American Machinist," Vol. 52.

Annual Convention of the Industrial Relations Association of America 1370
"American Machinist," Vol. 52.

The Railroad Wage Case 1371
"American Machinist," Vol. 52.

Conditions in France 1371
By Mason Britton
"American Machinist," Vol. 52.

What Other Editors Think 1374
The Railroads and the Public—No "Panic" in Sight — Neglect of Airplanes Invites National Destruction.
"American Machinist," Vol. 52.

What to Read—For the Man in a Hurry 1376
"American Machinist," Vol. 52.

Shop Equipment News 1377
Fox Multiple-Spindle Drilling Machine—Force Universal Clamps—Scully Jones Multiple-Spindle Dividing Head—General Electric M. T. Q. Auto Transformers.
"American Machinist," Vol. 52.

Business Conditions in England 1378
"American Machinist," Vol. 52.

Miscellaneous Articles:
Looking Backward, Stillman 1337
Use of Cross-Section Paper in Making Charts, Barr 1337
A Pattern Made from Odd Material, Dixie 1348
Sidelights on Automobile Building, Rich 1352
A Quick-Release Screw for Jigs, Wood 1354
Grinding Circular-Formed Cutter Teeth, Henry 1357
A Non-Blotting Triangle, Jacker 1357
Using Blanked Plates for Trimmer Dies, Armstrong 1359
A Shaper Kink, Folsom 1360
How To Keep Employees on the Job in Summer Time, Williams 1365
Why the Blueprint, Vincent 1369
"Honor to Whom Honor Is Due." 1373

Sparks from the World's Industrial Forge 1380
"American Machinist," Vol. 52.

Condensed Clipping Index of Shop Equipment News 1384 a

Weekly Price Guide Shop Materials and Supplies 1384 b and c

New and Enlarged Shops 1384 d

What and Where to Buy 338
Advertising Index 356

THE SPIRIT OF THE FEDERATION—See Page 1366

JAMES H. McGRAW, President — ARTHUR J. BALDWIN, Vice President — J. MALCOLM MUIR, Vice President — F. M. FEIKER, Vice President — EDWARD CALDWELL, Treasurer — JAMES H. McGRAW, JR., Secretary

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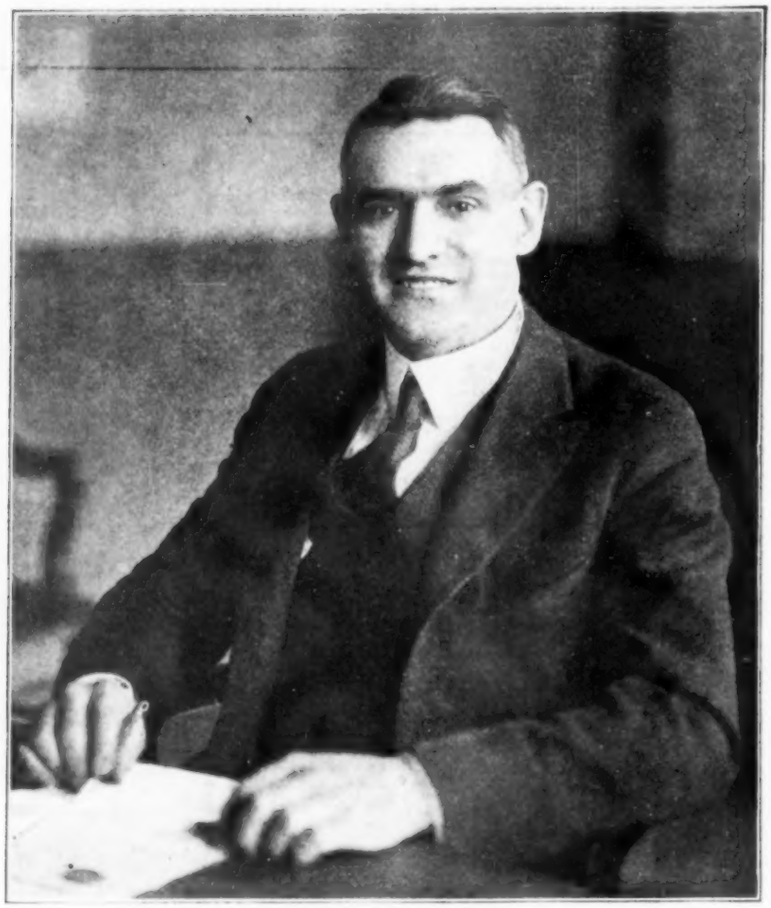
WHO'S WHO



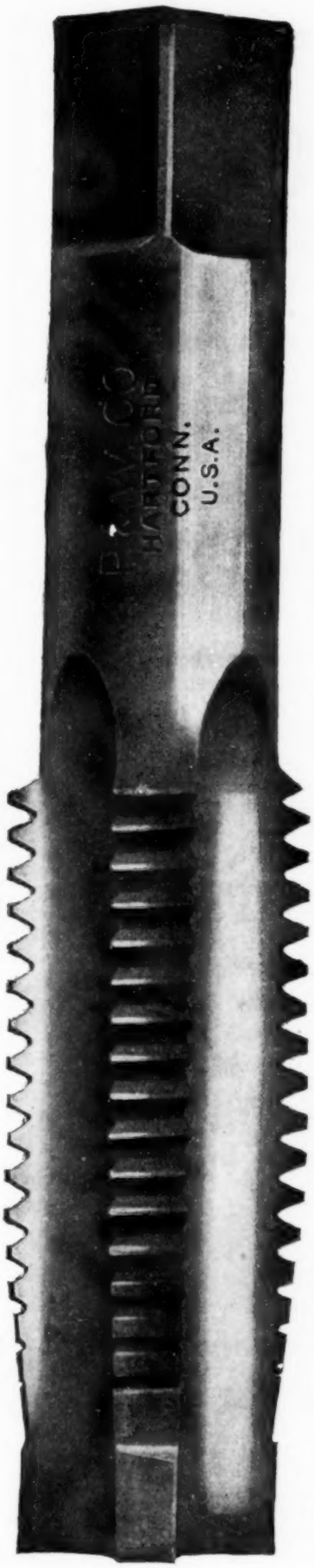
CHARLES WOOD CROSS

THIS week we present a likeness of Charles Wood Cross, Vice-President and General Manager of the American Twist Drill Company of Detroit, Michigan.

Mr. Cross was born June 20, 1879, in Cleveland, Ohio. A good part of his life was spent in growing up, and an interesting part at Cornell University, from which institution he was graduated with the degrees of M. E. and E. E. From an athletic standpoint his university career is noteworthy—right end on the Cornell Football Team for four years; All-American end for three years; played on the Baseball Team and rowed number four in the Crew. He also sang in the Cornell Glee Club, was a director of the Dramatic Club and an Alpha Delta Phi fraternity man.

The years immediately following graduation were put in washing cars and cleaning motors for an Interurban Railway, working up to the position of Electrical Engineer and Assistant Superintendent. Was a machinist and erecting man on a large crane construction and while acting as Mechanical Engineer for the Diamond Rubber Company, designed their first detachable tire moulds. As Branch Manager for the Crocker-Wheeler Company, he developed a number of labor-saving devices. In his present capacity Mr. Cross has been more than successful in establishing a reputation for producing a product of the highest quality.

Mr. Cross is an active member of the Detroit Athletic Club, Detroit Boat Club, Groose Ile Country Club, The Players, Detroit Board of Commerce, Cornell University Association of Michigan, American Institute of Electrical Engineers, Michigan Manufacturers' Association and the Society of Automotive Engineers. Mr. Cross is also a golf bug and steals away to fish whenever the opportunity offers.



A Quality Tap for Every Purpose

On every sort of tapping job, Pratt & Whitney Taps show their superiority. They bite into the work with a precision and ease that makes them favorites with the men that use them. They're made in every size, too, from the smallest standard to the longest staybolt tap. Good when new, they are heat treated and seasoned to maintain this goodness. "Con-eccentric land"—a special Pratt & Whitney feature—permits them to be sharpened on face of cutting edge without affecting their size. This ensures permanent accuracy.

Pratt & Whitney Taps are but one group of the Small Tools manufactured by us. These include Dies, Reamers, Drills, Punches, Milling Cutters, Die Stocks and many miscellaneous and special purpose tools.

Precision Machine Tools

In the advancement of toolroom practice, Pratt & Whitney has lead for a number of years, having developed many modern time and labor saving Precision Machine Tools. Notable among these are—the Vertical Shaper, Vertical Surface Grinder, Automatic Miller, Spline Miller, and many other machines that save machine hours in turning out the job.

Pratt & Whitney Co.

111 Broadway, New York, N. Y.

Works, Hartford, Conn.

Stocks of small tools at our stores and agencies in principal cities.

146

ASK THE OPERATOR

After all is said and done the prospective buyer of a lathe wants to hear about the practical performance more than anything else.

The item of dollars and cents is measured by what the lathe will actually do and no one is in a better position to give you first hand information than the operator himself.

Find a man who has run a

Lodge & Shipley Manufacturing Lathe

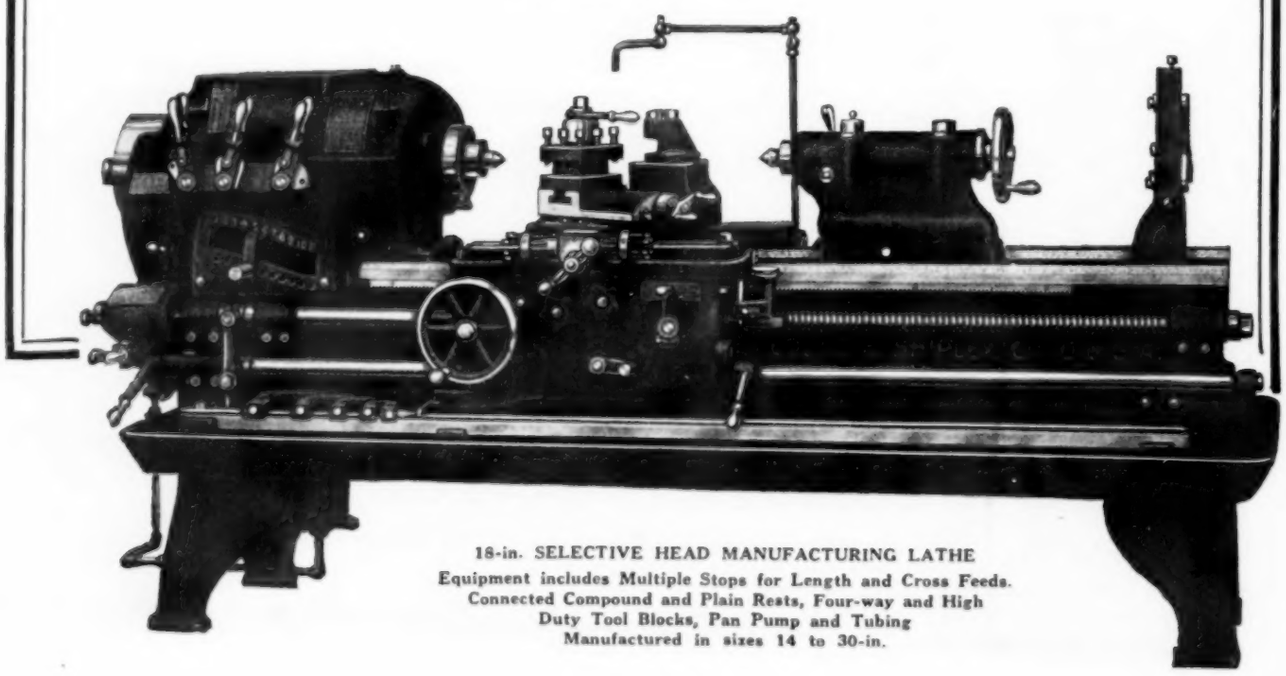
Put it up to him—what does he think of it?

The answer will be that it is a lathe which can be relied upon absolutely to do work accurately and with a considerable saving of time over any other lathe; that the simplicity of operation promotes a feeling of familiarity which enables the operator to produce more and better work. Find out for yourself!

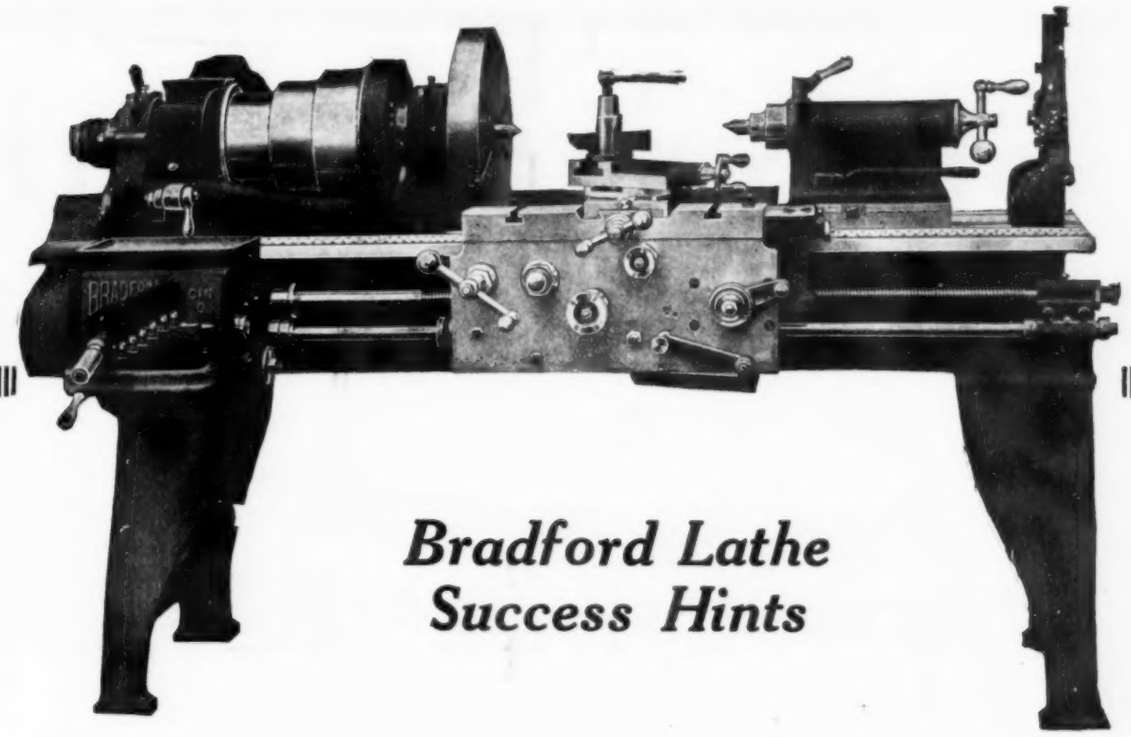
Write for Bulletin "Examples of Turning on a Manufacturing Lathe"

The Lodge & Shipley Machine Tool Co.

Cincinnati, Ohio



18-in. SELECTIVE HEAD MANUFACTURING LATHE
Equipment includes Multiple Stops for Length and Cross Feeds. Connected Compound and Plain Rests, Four-way and High Duty Tool Blocks, Pan Pump and Tubing
Manufactured in sizes 14 to 30-in.



Bradford Lathe Success Hints

"It is a very decent warrant of stability to serve one thing faithfully for a quarter of a century." **BENJAMIN FRANKLIN**

Few great men have given posterity as many sane precepts as Benjamin Franklin; and few of his sayings are better founded than that quoted above.

To have shared in America's industrial development for over a quarter-century is a privilege for which Bradford Machine Tool Co. is indeed grateful. The one thing "served faithfully" by us over a span of 35 years has been the making of lathes.

While to point to a lathe building record dating from 1885 is a source of pride, it is even more one of responsibility. We submit that the confidence bestowed on us by leading manufacturers who have been users of Bradford Lathes for a generation is a very sure measure of our ability to live up to your shop's expectations as to lathe performance.

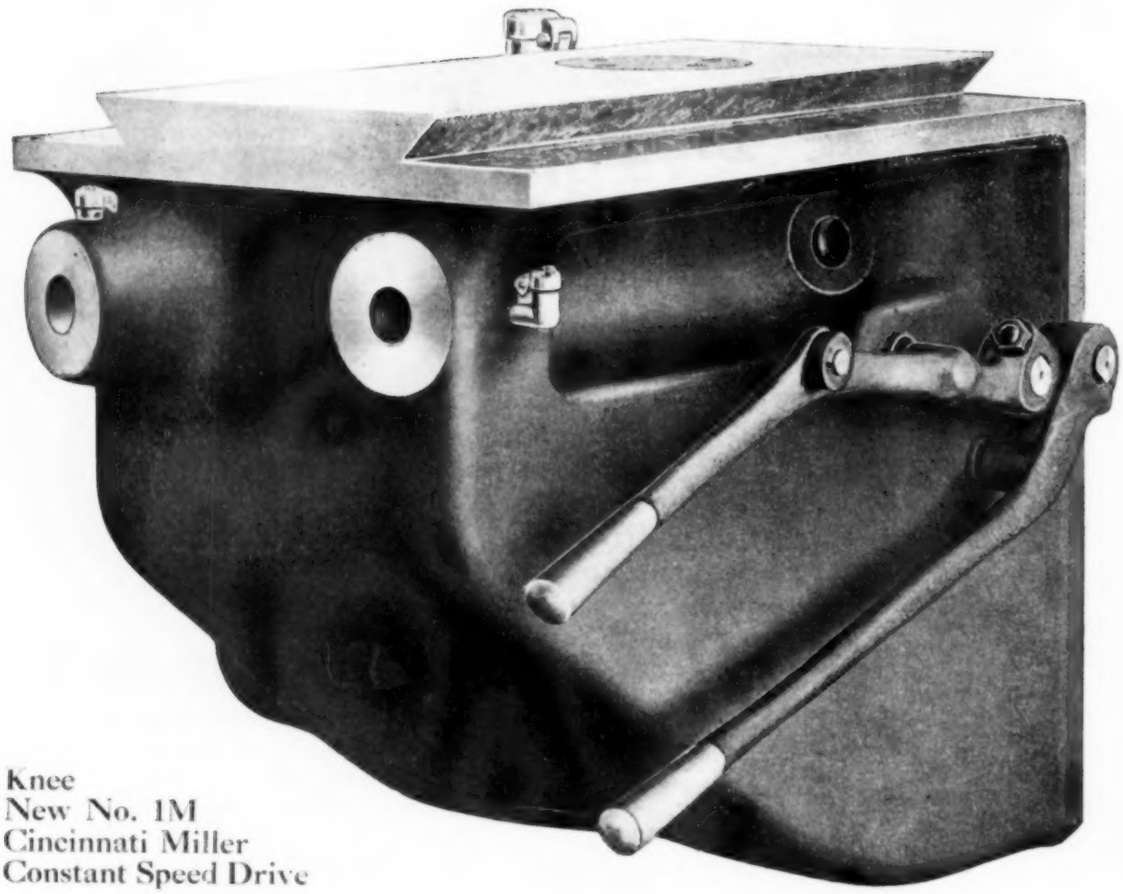
Do you know about Bradford Lathes?
You should.

The Bradford Machine Tool Company

Cincinnati, Ohio, U. S. A.

DOMESTIC AGENTS: Swind Machinery Co., Philadelphia, Pa.; Taylor Machinery Co., Boston, Mass.; Somers, Fitler & Todd Co., Pittsburgh, Pa.; The Stocker-Rumely-Wachs Co., Chicago, Ill.; Pacific Tool & Supply Co., San Francisco, Calif.; The Mine & Smelter Supply Co., Denver, Colo.; The E. A. Kinsey Company, Cincinnati, Ohio, Indianapolis, Ind.; W. J. Baird Machinery Co., Detroit, Mich.; Ogden R. Adams, Rochester, N. Y.; Ralph B. Bowman, St. Louis, Mo.; The Biggs-Watterson Co., Cleveland, Ohio; Northern Machinery Co., Duluth and Minneapolis, Minn.; McMullen Machinery Co., Grand Rapids, Mich.

Strength truly



Knee
New No. 1M
Cincinnati Miller
Constant Speed Drive

Ask us for a copy of the new catalog devoted exclusively to the new M Type Cincinnati Millers.

The Cincinnati Milling Machine

astonishing

the new M Type Cincinnati Millers

for example the No. 1M Knee

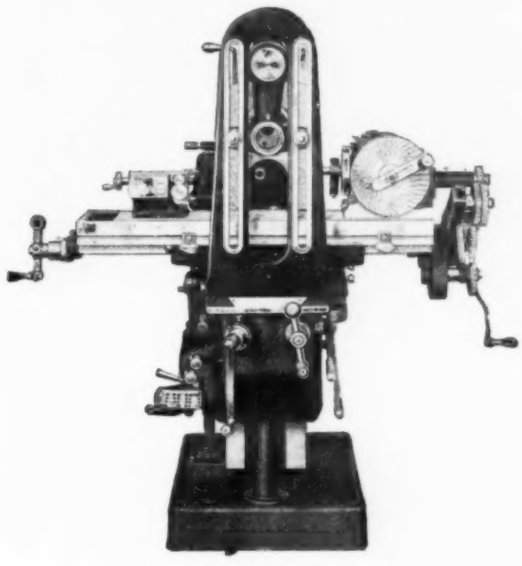
It is wider than the average existing No. 3 knee.

The bearing for the saddle is as wide as the extreme width of the knee itself.

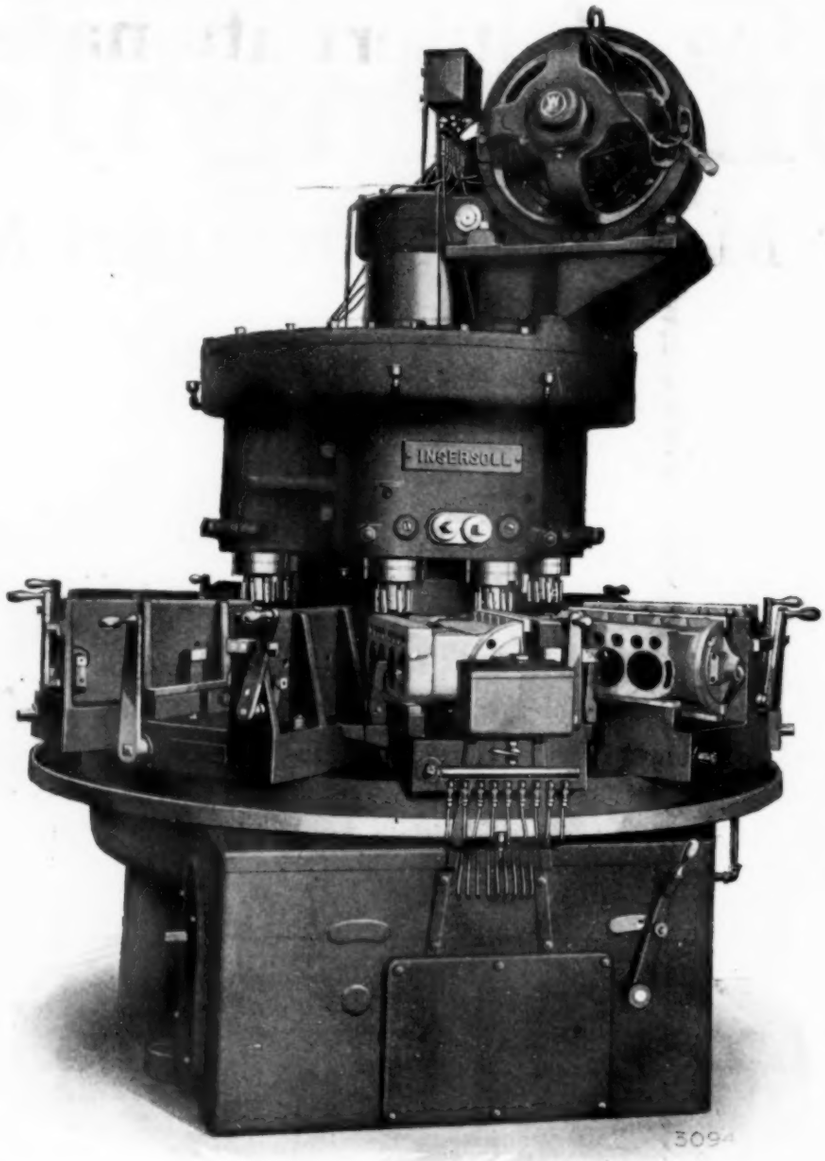
The top is solid, the knee being an enclosed member with the only opening that for the vertical screw.

The V-bearing forms a narrow guide for maintaining alignment.

The saddle bearings for the table are as wide as the table itself and as long as the full table travel.



Company, Cincinnati, Ohio



THE INGERSOLL CIRCULAR TABLE CONTINUOUS MILLING MACHINE is a multiple-spindle, multi-station Milling Machine on which all the spindles are *continuously* engaged in the work. The number of spindles and stations may be varied to suit the particular work in hand.

In the machine shown above, there are three stations. Each station has two spindles, one for the roughing cutter and the other for the finishing cutter. The table carries nine fixtures, each holding a cylinder casting while the starter pad is milled. The table revolves continuously beneath the spindles. The services of three men are required to unload and reload the fixtures on this tool.

This type of Continuous Milling Machine may also be made for two or four stations, depending on the work to be performed. We would like the opportunity of submitting layout sketches and time estimate of the possibilities your work offers on Ingersoll Milling Machines.

This is the fifth of a series of Continuous Milling Machine Advertisements.

Bulletin No. 37—"Ingersoll Face Milling Cutter Grinder"
Bulletin No. 38—"Ingersoll Milling Cutters"
Bulletin No. 39—"Ingersoll Continuous Milling Machines"

THE INGERSOLL MILLING MACHINE COMPANY

Milling Machines and Their Equipment

Main Office and Works: Rockford, Illinois, U. S. A.

New York—50 Church St.; Detroit—1457 David Whitney Bldg.; London—Burton, Griffiths & Co., Ltd.; Paris—Fenwick Freres & Co.

Speaking of Internationalism—

You will not find it better exemplified in machine tools than with Betts Boring Mills. These heavy duty machines are in use in practically every civilized country on the globe.

In America they are used in immense numbers by most of the famous plants.

This national and international use of Betts Tools forcibly demonstrates their superiority. It has taken considerable time of course to build up this world-wide service. We have been building boring mills since 1861.

So when you specify a Betts you are getting a boring mill that has been both tested out by long years of service and worldwide use.

Betts Tools:

Planers
Boring and Turning Mills

Horizontal Boring, Drilling anl Milling Machines

Tire Turning Mills

Car Wheel Borers Slotters, etc.

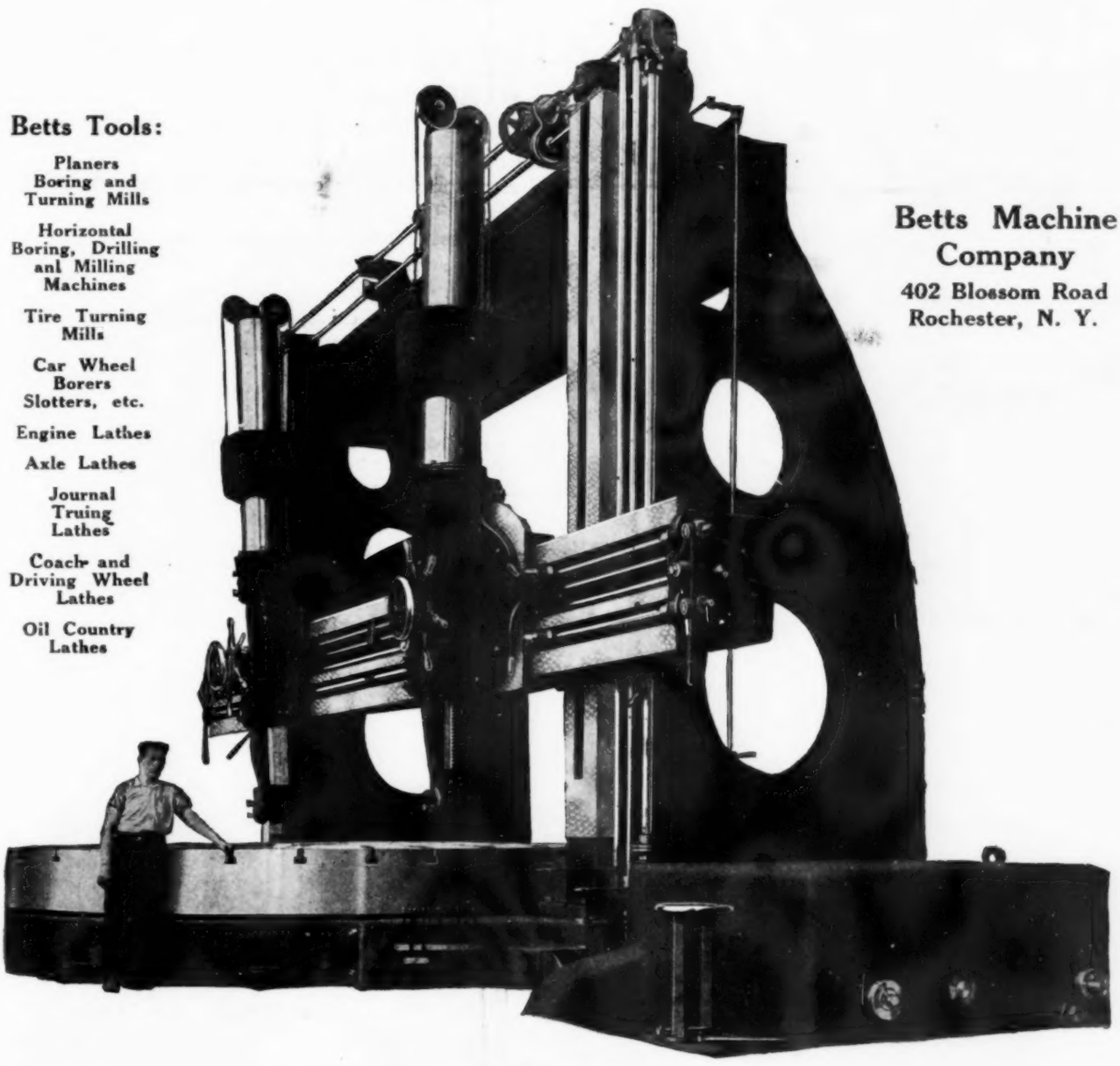
Engine Lathes

Axle Lathes

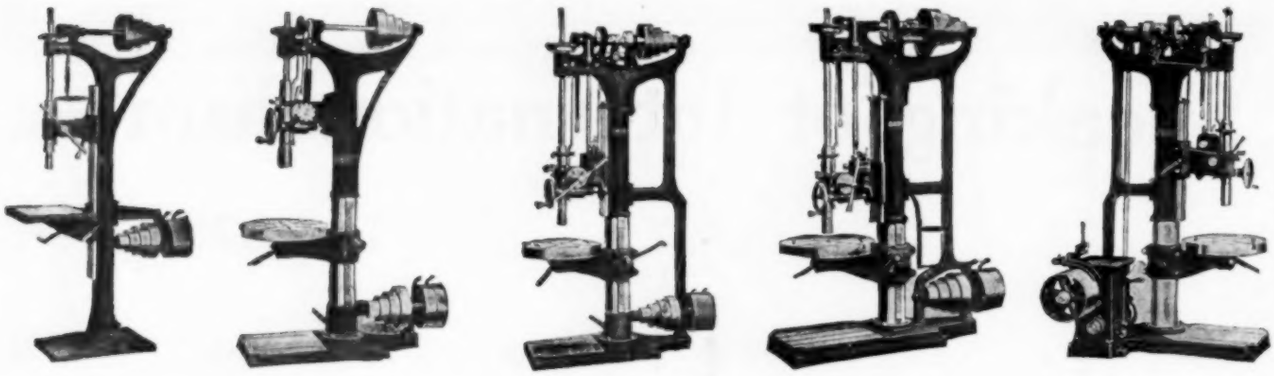
Journal Truing Lathes

Coach and Driving Wheel Lathes

Oil Country Lathes



Betts Machine Company
402 Blossom Road
Rochester, N. Y.



THE CINCINNATI BICKFORD

A Heavy Pattern Upright Made in 32 Styles

This is our 21-inch Stationary Head Drill. The illustration shows it equipped with Tapping attachment. The automatic trip disengages the feed at any desired depth and guards against the spindle being advanced beyond its intended range of movement. The drive is furnished in four styles: Regular cone drive, belted motor drive, geared motor drive, or a right angle drive. The table is furnished in three styles: round, square or compound.

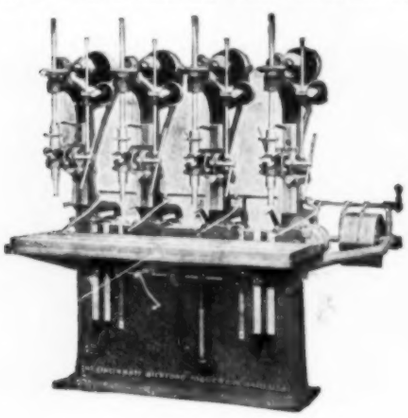
Our forty-five years' experience in building drilling machinery should not be overlooked when you are in the market for a high speed drill.

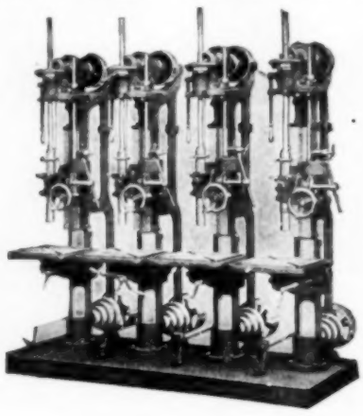
The Cincinnati Bickford Tool Co.

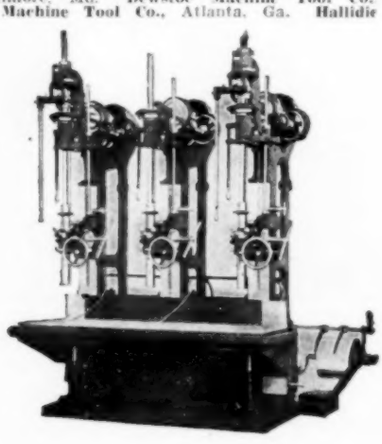
Oakley, Cincinnati, Ohio, U. S. A.

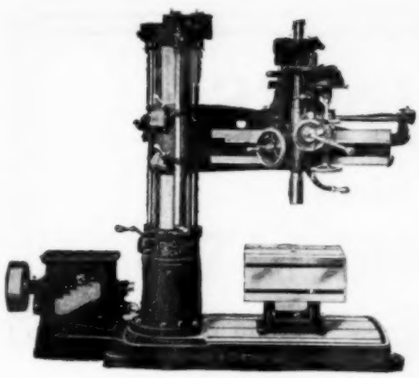
Founded 1874

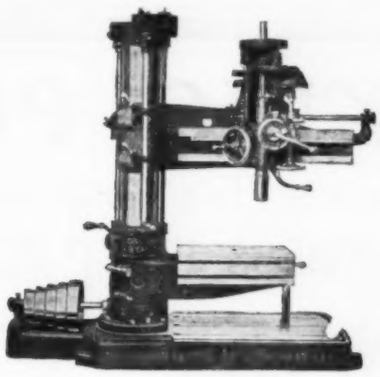
DOMESTIC AGENTS: Henry Prentiss & Co., Inc., New York; Hartford, Conn.; Boston, Mass.; Buffalo, Rochester and Syracuse, N. Y. **Moteh & Merryweather Machinery Co.,** Cleveland, Ohio; Detroit, Mich.; Cincinnati, Ohio, and Columbus, Ohio. **Marshall & Huschart Machinery Co.,** Chicago, Ill. **Brown & Zortman Machinery Co.,** Pittsburgh, Pa. **W. E. Shipley Machinery Co.,** Philadelphia, Pa. **Marshall & Huschart Machinery Co. of Indiana,** Indianapolis, Ind. **Elliott & Stephens Machinery Co.,** St. Louis, Mo. **Harron, Rickard & McCone,** San Francisco, Calif., and Los Angeles, Calif. **C. T. Patterson Co., Ltd.,** New Orleans, La. **Robinson, Cary & Sands Co.,** St. Paul, Minn., and Duluth, Minn. **Kemp Machinery Co.,** Baltimore, Md. **Dewstoe Machine Tool Co.,** Birmingham, Ala. **Seeger Machine Tool Co.,** Atlanta, Ga. **Hallidie**

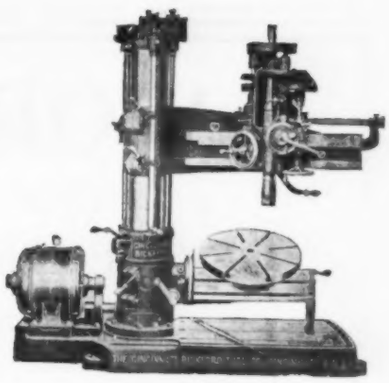












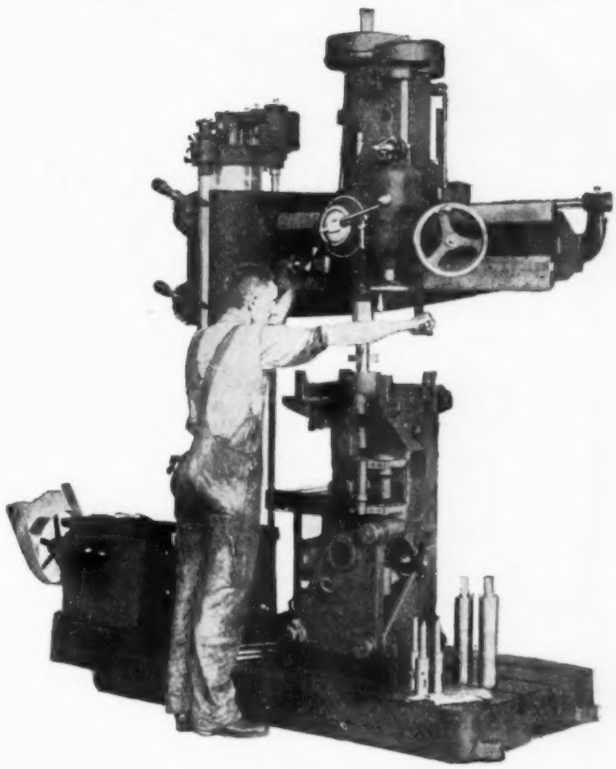
THE CINCINNATI

Gives the Operator An Easy Time

Control levers are within easy reach and the machine gives the operator so little trouble he can devote more than the usual attention to the work.

In the picture is shown a tall piece of work — just within the machine's capacity. The operator finds it easy to keep one hand on the reverse lever and the other on the back gear lever, thus averting shock and clash when changing gears.

This is our 4, 5 and 6 foot Plain Radial. It has many admirable features that are covered in detail in our radial drill circulars. ***We would like to send you a set.***

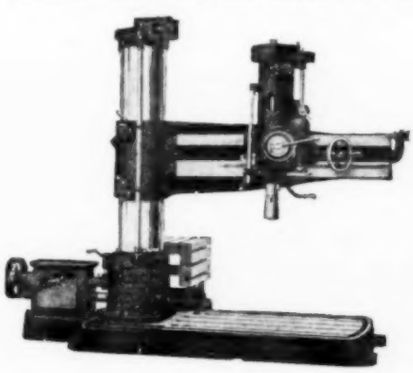


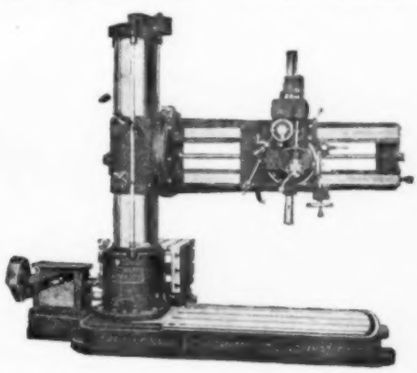
The Cincinnati Bickford Tool Co.

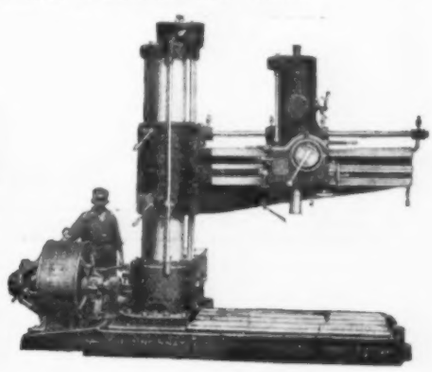
Oakley, Cincinnati, Ohio, U. S. A.

Founded 1874

Machinery Co., Seattle, Wash. **Hallidie Co.**, Spokane, Wash. **Zimmerman-Wells-Brown Co.**, Portland, Ore. **Charlotte Supply Co.**, Charlotte, N. C. **Cochran Machine Tool Co.**, Memphis, Tenn. **CANADIAN AGENTS: H. W. Petrie, Ltd.**, Toronto, Ont. **Williams & Wilson, Ltd.**, Montreal and Quebec. **FOREIGN AGENTS: Charles Churchill & Co., Ltd.**, London, Manchester, Birmingham, Newcastle-on-Tyne, England, and Glasgow, Scotland. **Aux Forges de Vulcain**, Paris, France. **Ateliers Demoor St. Ame**, Brussels, Belgium. **Chr. A. Herstad**, Copenhagen, Denmark and Stockholm, Sweden. **Andrews & George Co.**, Tokyo, Japan. **McPherson's Pty., Ltd.**, Melbourne, Australia. **Bartle & Co.**, Johannesburg, South Africa. **H. S. Gray Co.**, Honolulu, Hawaii. **Gustav Nielsen**, Christiania, Norway. **Maskin-Aktiebolaget E. Gronblom**, Abo, Finland.







WORKING POINTS

(Not Talking Points or Selling Points)

OF THE HARTNESS FLAT TURRET LATHE

Chucking Tools—II

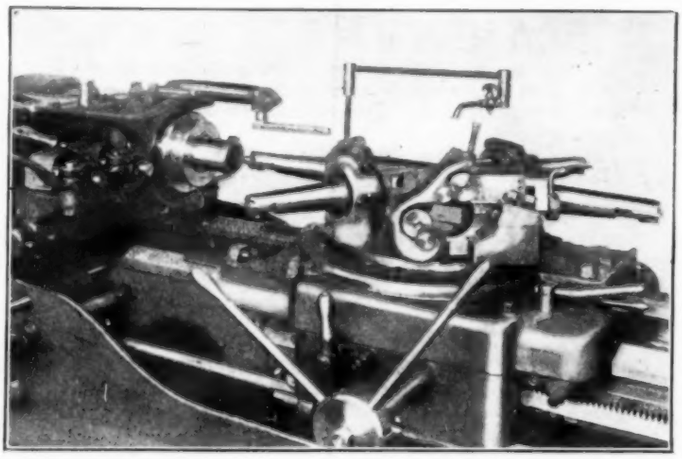
The regular outfit of the Hartness Flat Turret Lathe will do a surprising variety of work—so wide a variety as to make it an ideal machine for small shops and small lots.

It is just as well known as an ideal machine for large lots and continuous production. On this work it is sometimes advisable to incorporate certain special features to carry the efficiency of the operation to the furthest limit.

The Flat Turret is particularly well adapted to special tooling, owing to its broad clamping surface and rigid construction and control.

We have, in addition, developed many special outfits into a semi-standard design, so great is the volume of our business in continuous productive industries.

The outfit shown below illustrates both of these points. It is one of a large number of shell outfits furnished during the war.



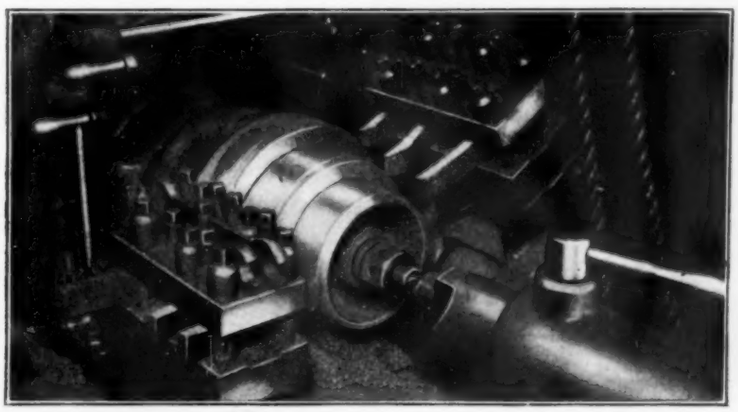
Jones & Lamson

Springfield, Vermont, U.S.A.
503 Market St., San Francisco, Calif. U.S.A.
109 Queen Victoria St., London, E.C.

THE FAY WAY

of

MACHINING A 3-STEP CONE PULLEY



The Pulley shown in the photograph is a 3-step Cone Pulley being done in the plant of the Garvin Machine Company, New York.

"Garvin" takes pride in this particular operation, and says this is the fastest and closest method they can employ in finishing cone pulleys.

All turning and facing cuts are taken simultaneously. The back arm rocks in and faces as the front carriage moves forward and turns.

Observe the multiple tooling.

The Pulley is machined complete in the time taken to turn one step.

All roughing and finishing cuts are taken simultaneously—two machines one operator.

The tooling and tool blocks are standard—no special attachments are needed.

The largest step is 11 in. diameter. Widest face is 3 in.

Pulley Before Fay Operation

Garvin says: "Working to the thousandth of an inch the production is one finished pulley every 8 minutes."

This is only one of many profitable jobs of the Fay Lathe.

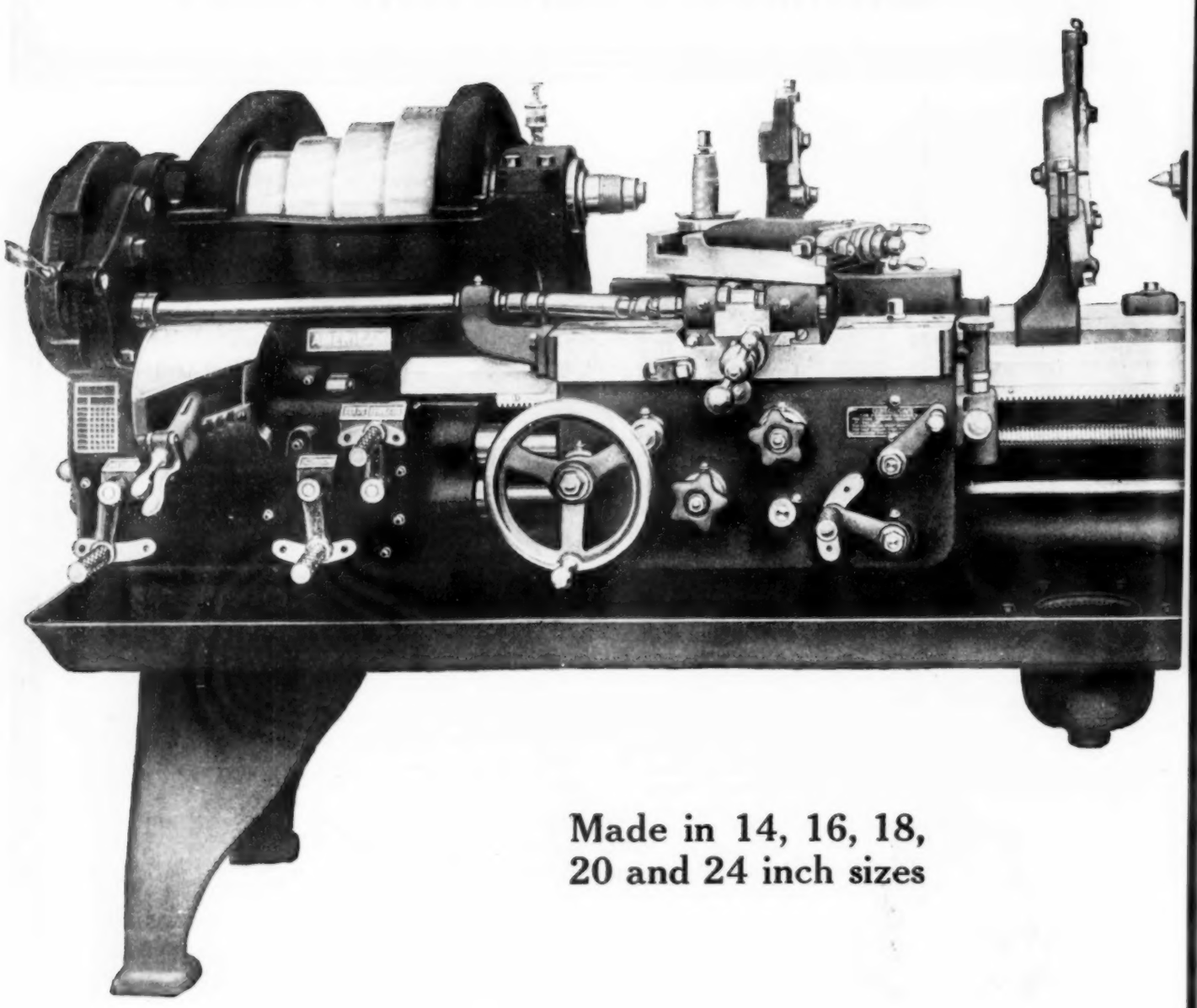
Put your production problems up to our Engineering Department.

Pulley After Fay Operation

Machine Company

France, Spain and Belgium: F. Auberty & Co., 91 Rue de Maubeuge, Paris
Holland: Spliethof Beeuwkes & Company, Rotterdam
Japan, Korea, etc. Mitsui & Company. Ltd., Tokio.
Australasia, McPherson's Pty., Ltd., 554 Collins St., Melbourne.

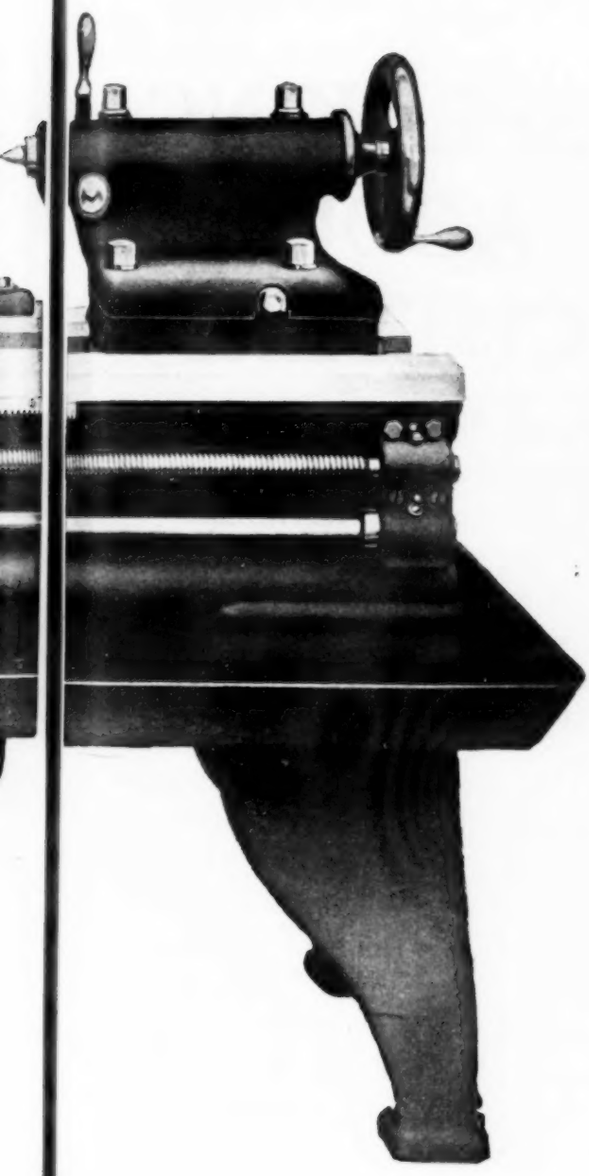
Good Tools



Made in 14, 16, 18, 20 and 24 inch sizes

AMERICAN

Are Essential—



to maintain quality production, and a good tool-room lathe is essential for making good tools.

Therefore, the quality of your work is determined by the productions of your tool room lathe.

AMERICAN
Tool Room Lathes

are so carefully and competently designed—so exceptionally well built—that it is an easy matter to produce accurate tools with them.

With American Tool Room Lathes then, your work is well begun.

If you knew the class of workmanship and kind of material used in their manufacture, you would never hesitate a moment in specifying American Tool Room Lathes. You would know then that their service must of necessity be right—their upkeep cost low—their reliability unquestioned.

Begin your work well by specifying "Americans." They will add to your profits, cut down your manufacturing costs, put your tool room work on a satisfactory basis.

The American Tool Works Co.
Cincinnati, Ohio

Lathes ***Planers*** ***Shapers*** ***Radials***

AMERICAN

F.G.S.Co. **SERVICE, ACCURACY, PRODUCTION** F.G.S.Co.

SPEAKING ABOUT CUTTERS

This Cutter Has Produced Over 1,500 Good Gears and Can Still Do More

One of the secrets for the success of the Gear Shaper is the cutter—an accurate cutter—made so by a grinding process by which its involute curves are generated after hardening.

No matter how well a cutter may be made, it is bound to twist in hardening—go out of shape. We don't try to stop this. Let 'em distort, since they must, anyway; but then we grind them, involute curves and all, to the finest degree of accuracy.

The Fellows Gear Shaper Company

Springfield, Vermont, U. S. A.

Foreign Agents: Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Ltd., Calcutta, India.

SERVICE, ACCURACY, PRODUCTION

There is a long life of service ahead of every Gear Shaper Cutter. A good half inch of stock may be ground away in resharpening before the cutter is done for. Just look at the difference between the two cutters shown here. One is new, and the other ground down, but still useful.

Each resharpening removes only a few thousands, and there are 500 thousands in half an inch, so you can readily see where the long life comes from.

A New Gear Shaper Cutter Ready for Work

The Gear Shaper Cutter and the Gear Shaper are the best paying investment in the gear cutting field. If you have not already proved this, you owe it to yourself to make us prove it. Take your first step in this direction by sending for a copy of our booklet "Commercial Gear Cutting." It will not only furnish you with some intensely interesting reading, but may be the means of solving some of your perplexing problems.

It is Gratis

The Fellows Gear Shaper Company

Springfield, Vermont, U. S. A.

Foreign Agents: Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Ltd., Calcutta, India.

NEW

HOW IT LOOKS WHEN CHARTED

IN WHICH CLASS?

Do your machines operate continuously during the working day or is setting-up time cutting into efficiency?

Every time your machine stops, production is decreased and overhead is increased.

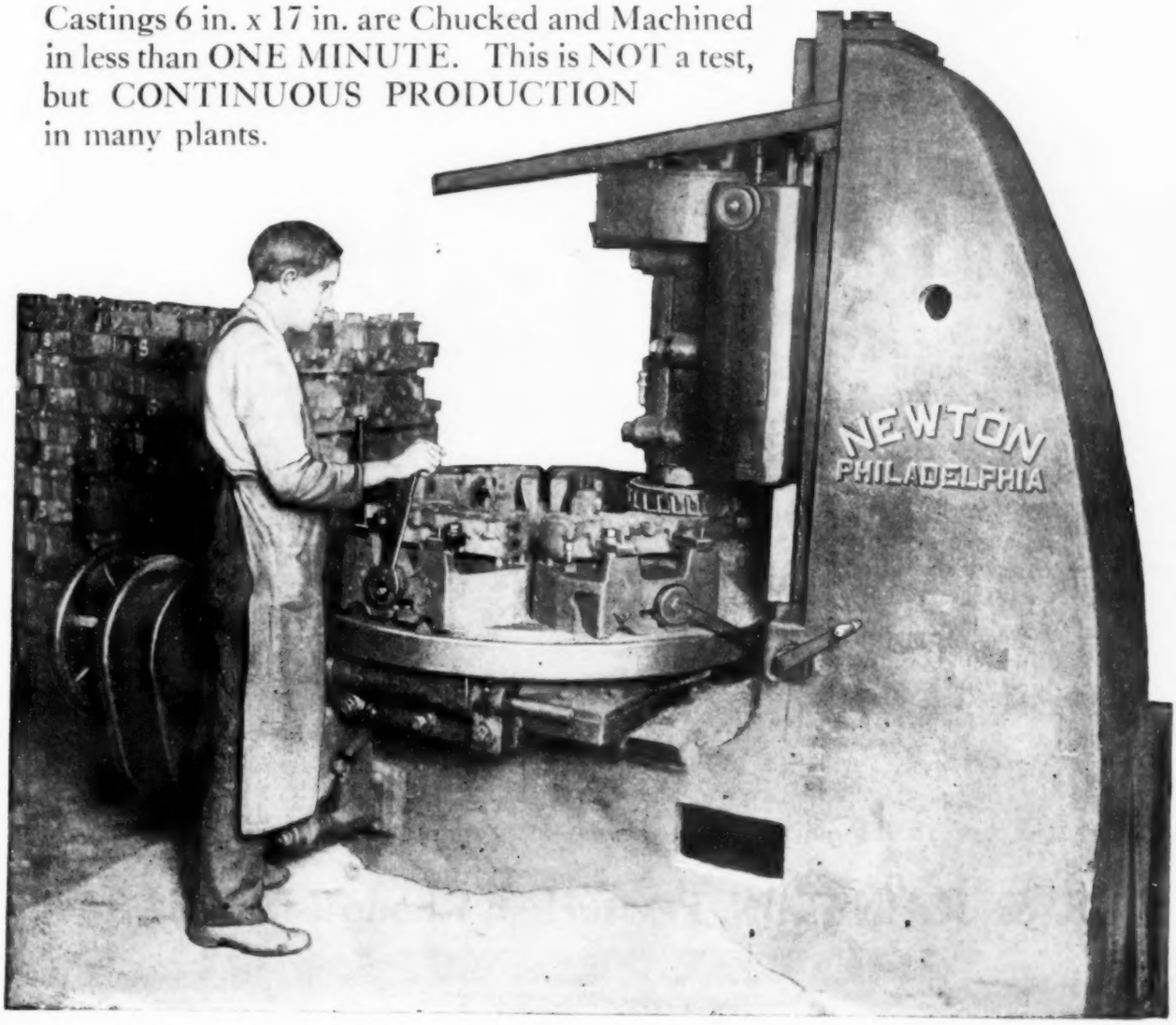
Continuous milling is applicable to most types of milling work and your requirements will receive careful and prompt attention if taken up with Newton's engineers.

NEWTON MACHINE TOOL WORKS, Inc.

TON

CONTINUOUS FEED ON THIS TYPE OF NEWTON MILLER IS 28 INCHES PER MINUTE

Castings 6 in. x 17 in. are Chucked and Machined in less than ONE MINUTE. This is NOT a test, but CONTINUOUS PRODUCTION in many plants.



TWENTY-THIRD AND VINE STS., PHILADELPHIA, U. S. A.

2 Hands

The P & J—

two—three—four—five—even six P & J Automatics have been handled by one pair of hands. You can pay big wages to half as many hands and still be paying less than you were before you installed P & J's. That's a certainty. And consider the ease with which the P & J Automatics do your work—no matter what the work, whether it's boring, milling, threading or facing. In making duplicate parts, the number of operations possible for the P & J is well nigh unlimited.

And the speed—have you considered this? Many are the instances where P & J Automatics have doubled production while cutting the man cost in half.

You are sure of accuracy, too, with a few P & J's on the job—whether or not the work is complex and severe.

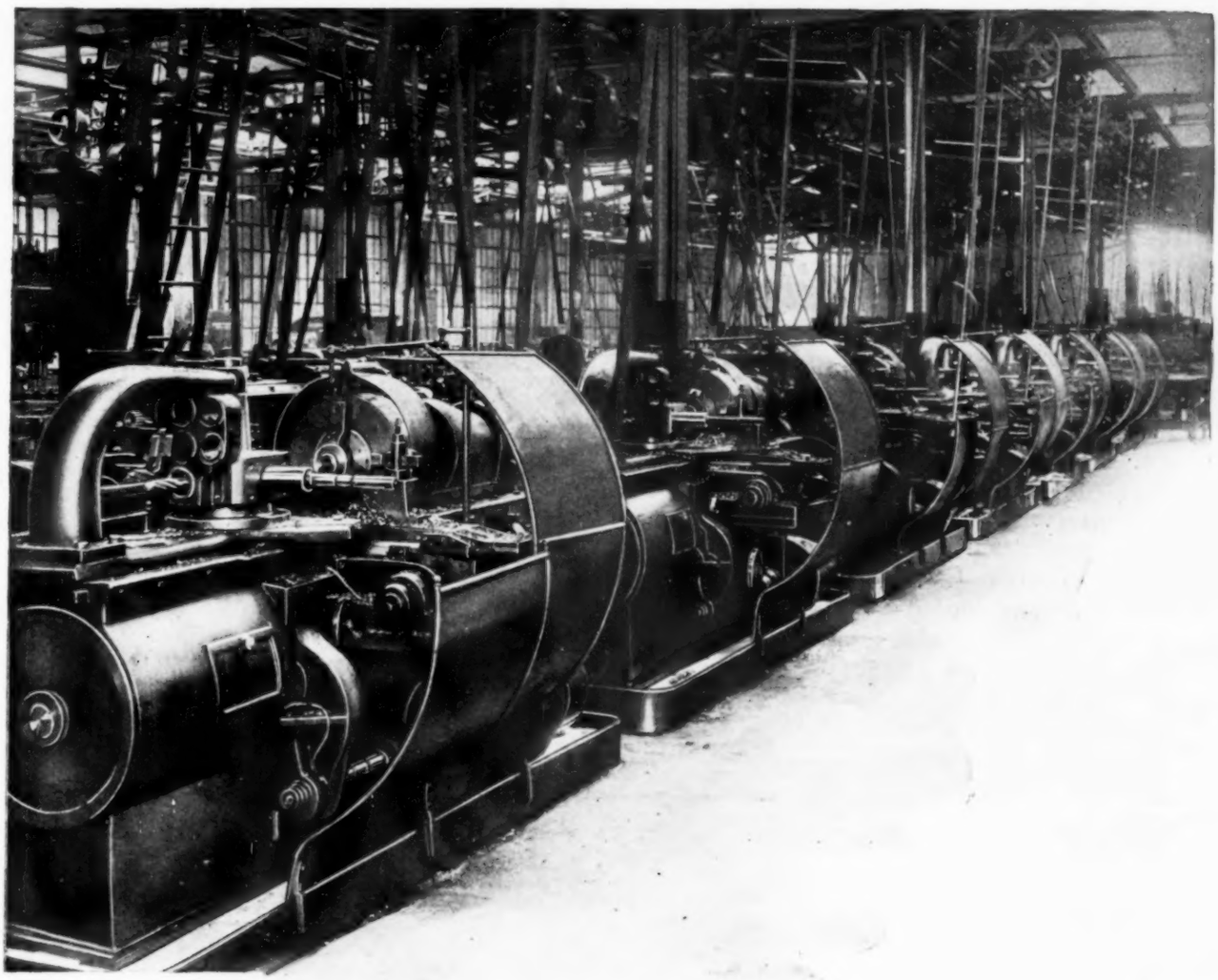
Five to fifteen cutting tools, carried with turret, cross slide and back facer tool holders, may be in simultaneous operation.

The work you are doing may be extremely unusual. How long does it take you to turn it out? How many hands does it require? If you send us samples or blueprints of your work, we will let you know what the P & J can do for you.

POTTER & JOHNSTON, Pawtucket, Rhode Island, U.S.A.

New York Office: Fulton Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: Modern Machinery & Engineering Co., 1514 Ford Bldg. Chicago Office: 1001 McCormick Bldg., Chas. H. Shaw, Manager. Toronto Office: 1501 Royal Bank Bldg., E. C. Roelofson, Manager. Foreign Offices and Representatives: Office for Great Britain, France, Italy, Belgium, Switzerland, Spain and Portugal, Potter & Johnston Machine Co., 68 Ave. de la Grande Armee, Paris, France, J. Ryan, Manager. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nouva, 34 Milan, Italy. Rylander & Asplund, Stockholm, Sweden.

Instead of 12



Cutting Costs with Every Cut

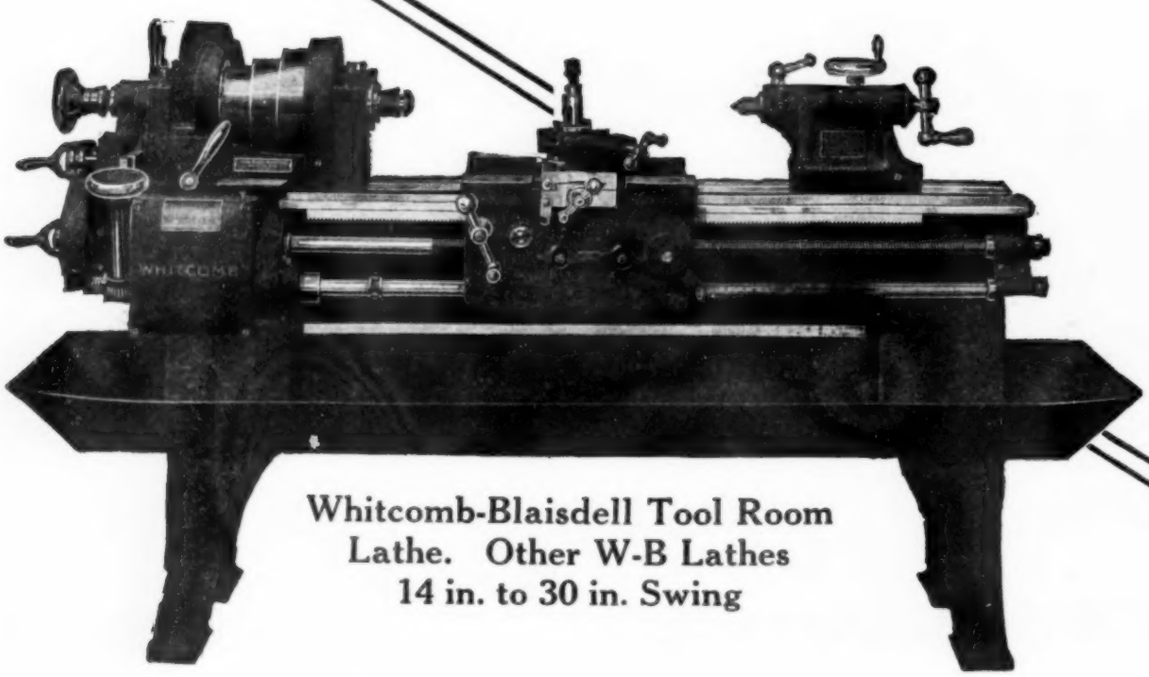
COST conservation is the motto that holds the most prominent position on the walls of a manufacturing plant. Production must be jumped to meet demands but outlay must be curbed.

The prime factors in a tool room lathe should be adaptability and accuracy. The Whitcomb-Blaisdell Tool Room Lathe ably meets these two.

It is accurate because it is made under the most improved shop methods by a highly skilled force of mechanics. It is adaptable because there are incorporated in it many features of utmost value to the tool maker.

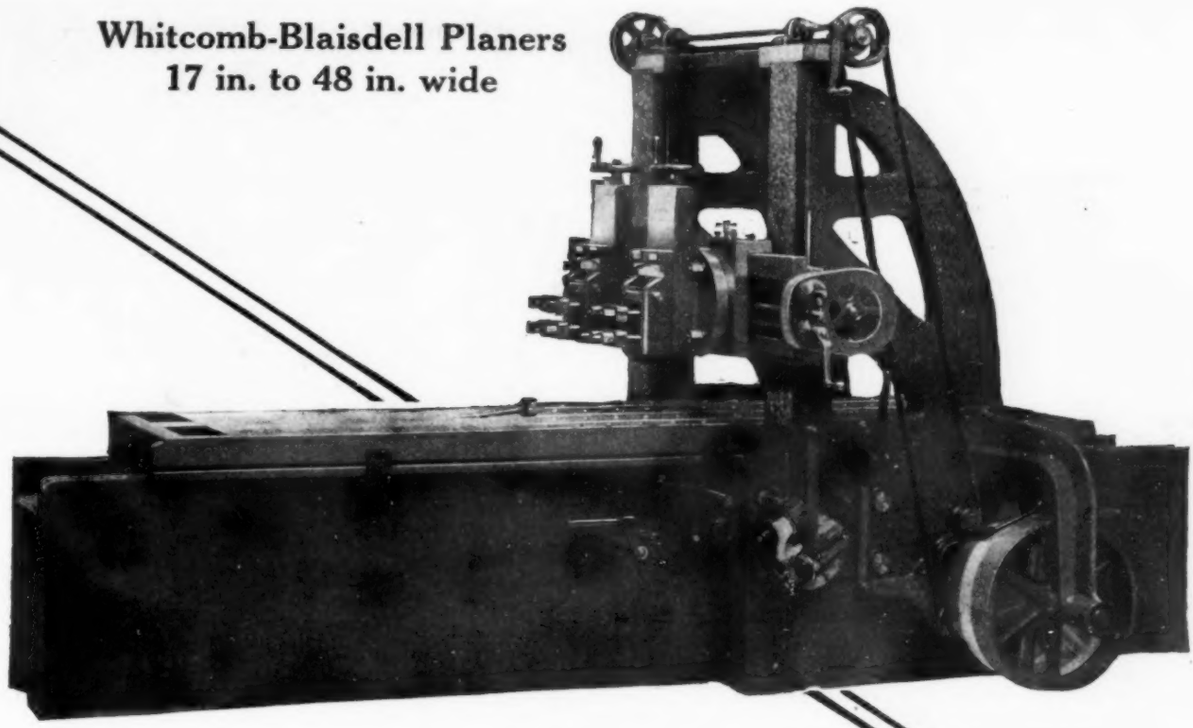
The Whitcomb-Blaisdell line of lathes covers the field. Over 60 years of intensive study of lathe requirements place our organization in a position to know how to design and construct them. Our order books show that our patrons are among the largest in the manufacturing field.

Whitcomb-Blaisdell Lathes



Whitcomb-Blaisdell Tool Room Lathe. Other W-B Lathes 14 in. to 30 in. Swing

Whitcomb-Blaisdell Planers
17 in. to 48 in. wide



Whitcomb-Blaisdell Planers

THERE is always a good and sufficient reason for a manufacturer insisting on a certain make of machine tool.

There are several such reasons for the popularity of Whitcomb-Blaisdell Second-Belt Drive Planers.

The friction feed insures positive feeds when heads are taking their heaviest cuts.

The Second-Belt Drive gives a soft, smooth action that is unknown in the spur-geared planer. This assures smoothly finished parts.

Quiet action makes it possible to operate the planer at far greater speeds than is possible with other types. Rapid running gears are eliminated and with them most of the noise that usually accompanies a planer. Further, there is no power loss due to friction.

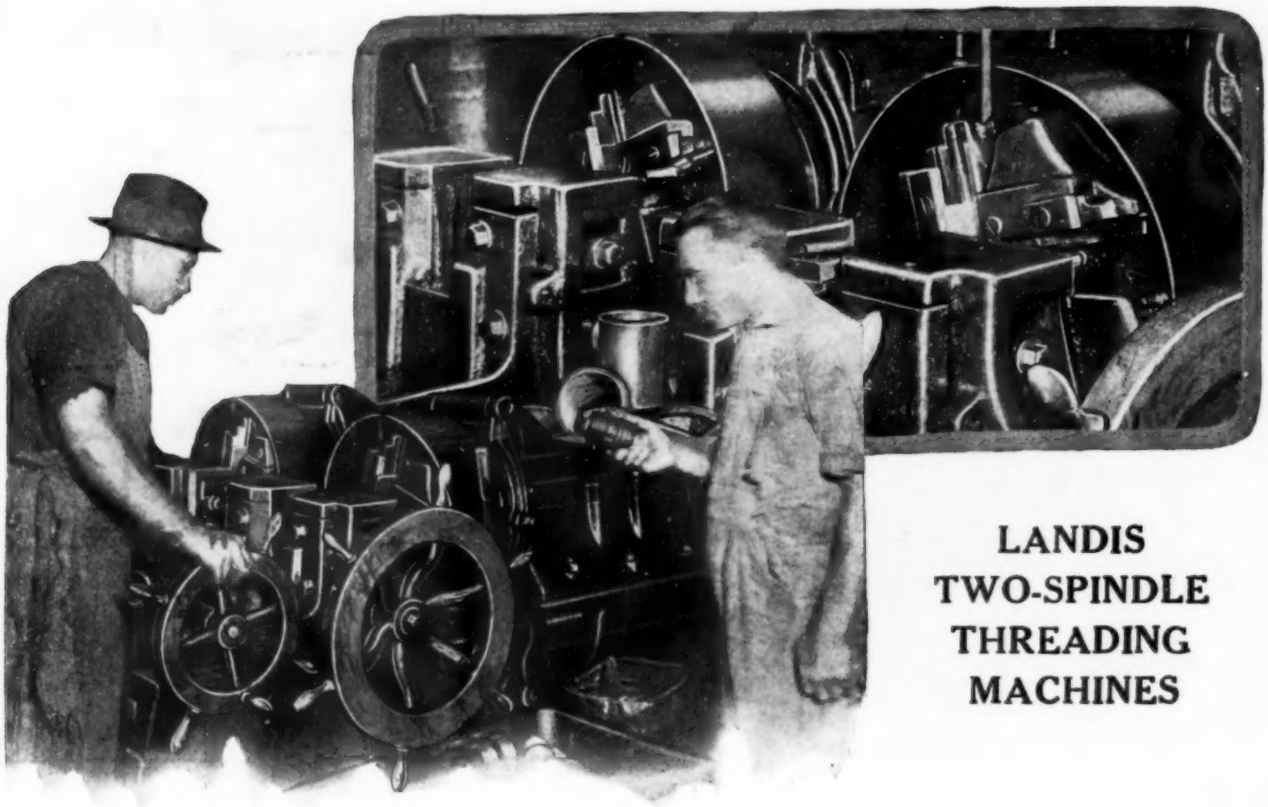
The Second-Belt Drive delivers more power to the table and this means greater efficiency. W-B Planers are running at extremely high speeds in hundreds of plants in this country and abroad. One hundred feet cutting speeds are not unusual.

Perhaps you can stand a little spurt in speeds in your planing departments. The W-B catalog will show you how to accomplish it. Ask for your copy.

Whitcomb-Blaisdell Machine Tool Co.
Worcester, Mass.

AGENTS—Boston, Mass.: Factory & Mill Supply Co., 137 Oliver St. New York City: Dale-Brewster Mchy. Co., 54 Lafayette St. Rochester, N. Y.: Ogden R. Adams, St. Paul & Central Avenue. Buffalo, New York: Ogden R. Adams, St. Paul & Central Avenue, Rochester. Syracuse, New York: C. H. Wood Co., 214 West Jefferson St. Cleveland, Ohio: Niles Tool Works Co., 730 Superior Ave., N. W. Detroit, Michigan: W. J. Baird Machinery Company. Chicago, Illinois: Dale-Brewster Machinery Company. Indianapolis, Indiana: T. C. McDonald, 940 Lemcke Annex. Pittsburgh, Penna.: Fairbanks Company. San Francisco, Calif.: Niles-Bement-Pond Co., 16 Fremont St., Philadelphia, Penna.: Niles-Bement-Pond Co. Cincinnati, Ohio: Fairbanks Co. St. Louis, Mo. Milwaukee, Wis.: Badger-Packard Mchy. Co. England: Selson Engineering Company, 85 Queen Victoria St., London. France, Belgium, Spain, Portugal, Italy, Switzerland: Fenwick Freres & Co., 8 Rue de Rocroy, Paris, France.

Japan: Mayer & Lage, Kobe. Sweden: Wilh. Sonesson & Co., Malmo, Sweden. Canada: A. R. Williams Machinery Co., Toronto and Montreal.



LANDIS TWO-SPINDLE THREADING MACHINES

One lonely Landis performing startling tricks

Recommended five more—and now there are six

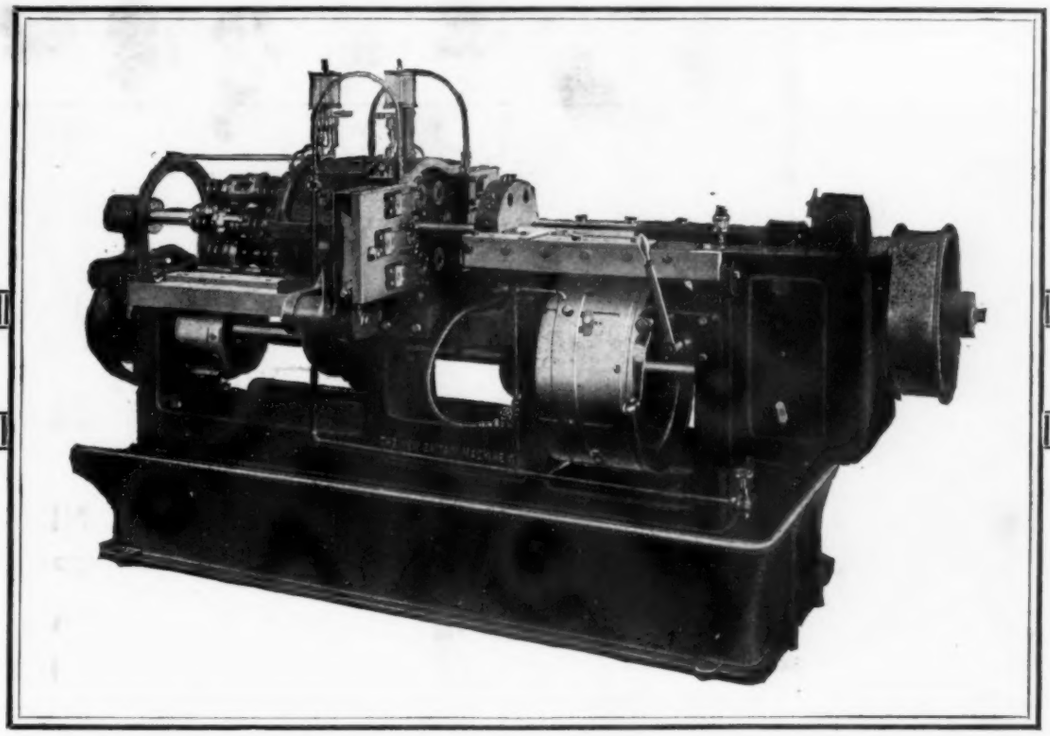
Here is one of the six in the plant of Cornell & Underhill, New York City. Investigation convinced them the Landis was worth a trial; actual experience clinched their friendship—and now there are six. It was five years ago that they installed the machine illustrated above. General threading of wrought steel pipe and nipples is done on these machines.

The two salient features of Landis Machines are Landis Chasers which out-live any other twenty times; the Landis Variable Rake Angle which permits of grinding suitable to the material being threaded.

There are other features. Literature?

Landis Machine Co., Waynesboro, Pa.

LANDIS



780 STUD BLANKS

Per Hour

The New Britain Machine Company

New Britain, Conn. U.S.A.

AS a job of machining this *stud blank* presents no tooling difficulties whatever.

Its interest lies in its very *simplicity* and the resultant possibilities for *rapid production*.

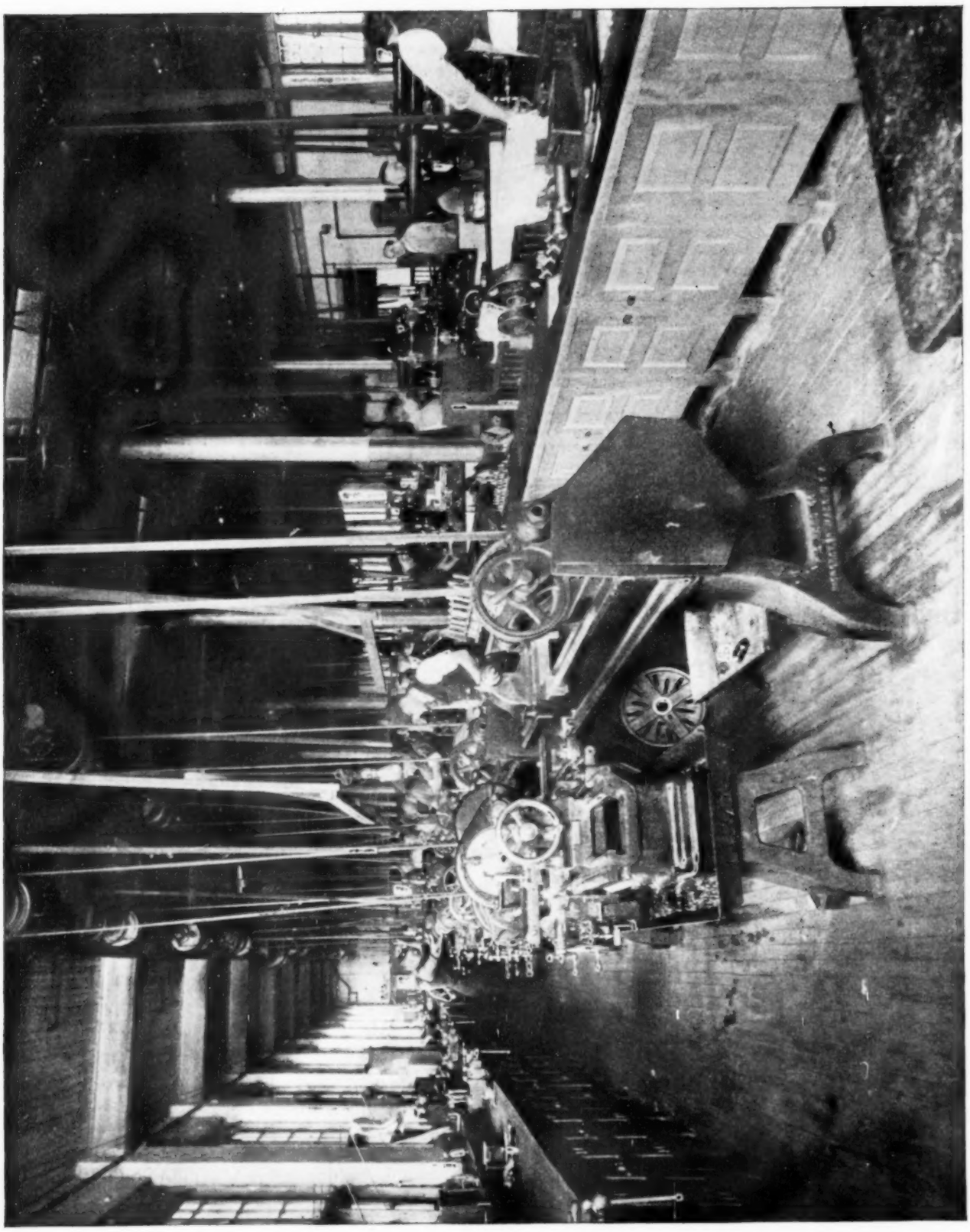
Formerly work of this character was turned out *one-at-a-time* in *single-spindle* automatics.

Today it is being handled *six-at-a-time* in *"New Britain" Sextuple Automatic Bar Machines* at a rate practically *six-fold* that previously obtained.

To its capacity for greatly *increasing production* add the saving in *floor space* and *first cost of machines* and you have the secret of the New Britain's rapid adoption on such work, as *nuts, sleeves, rolls, pipe couplings, piston pins*, and other jobs requiring drilling, facing, chamfering and cutting off only.

Perhaps you have machines tied up on *simple* jobs which could be more *profitably* used on other work? We'd like to look into the subject with you. Write for bulletin No. 955.

NEW BRITAIN AUTOMATICS



TOOL ROOM

We show here a section of our tool room which is one of the most interesting departments in our business, and is as complete as possible in every respect to expedite in the producing of tools of all descriptions for our automatics and the tools necessary for factory use.

To keep up interchangeability in the manufacturing business it is necessary to be well equipped in every respect to produce tools of all kinds accurately and with speed.

A tool room many years ago was considered by many an expensive proposition for the reason that a vast amount of money in many lines was necessary to keep up all the tools and fixtures for a good sized plant, and those in charge felt that this was an expense that was somewhat of a nuisance at times because more or less of the profit was used to supply their manufacturing end with that which they required for accurate producing, but nowadays a tool room is operated on a different viewpoint and that is, the money spent in the right equipment naturally means more output throughout your factory with a product that is a duplication, doing away with the use of the file so freely, and consequently much more satisfactory results.

CLEVELAND AUTOMATIC MACHINE CO.

CLEVELAND, OHIO, U.S.A.

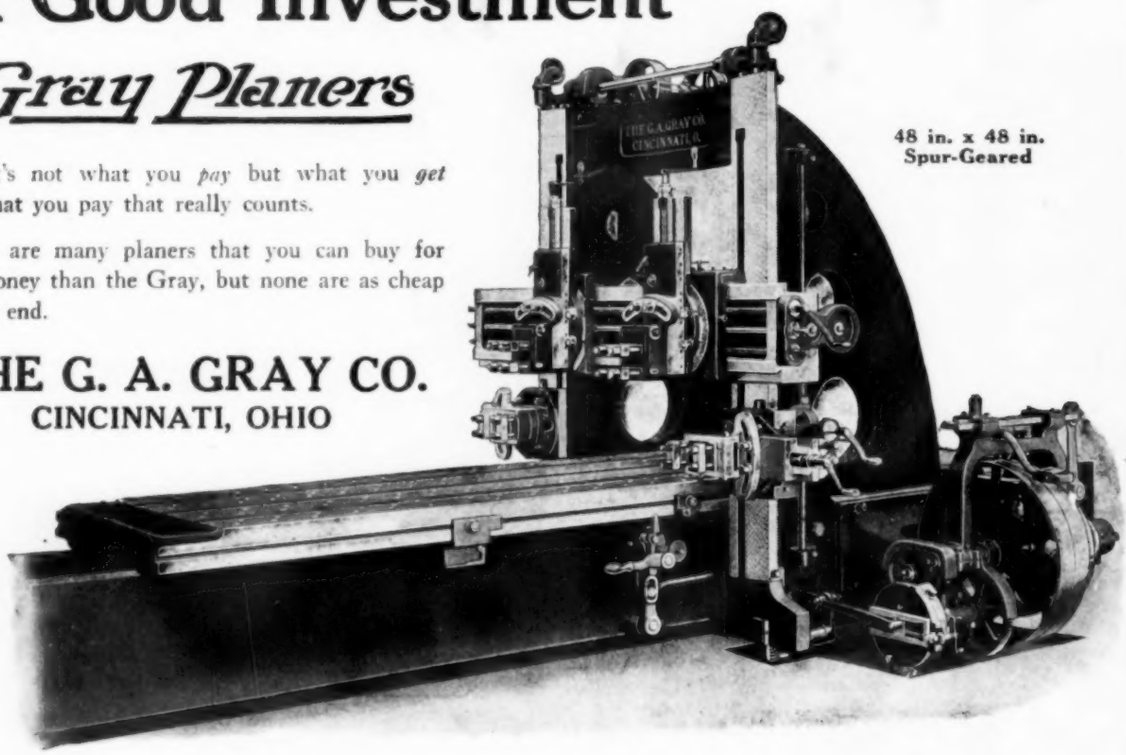
A Good Investment

Gray Planers

For it's not what you *pay* but what you *get* for what you pay that really counts.

There are many planers that you can buy for less money than the Gray, but none are as cheap in the end.

THE G. A. GRAY CO.
CINCINNATI, OHIO



48 in. x 48 in. Spur-Geared

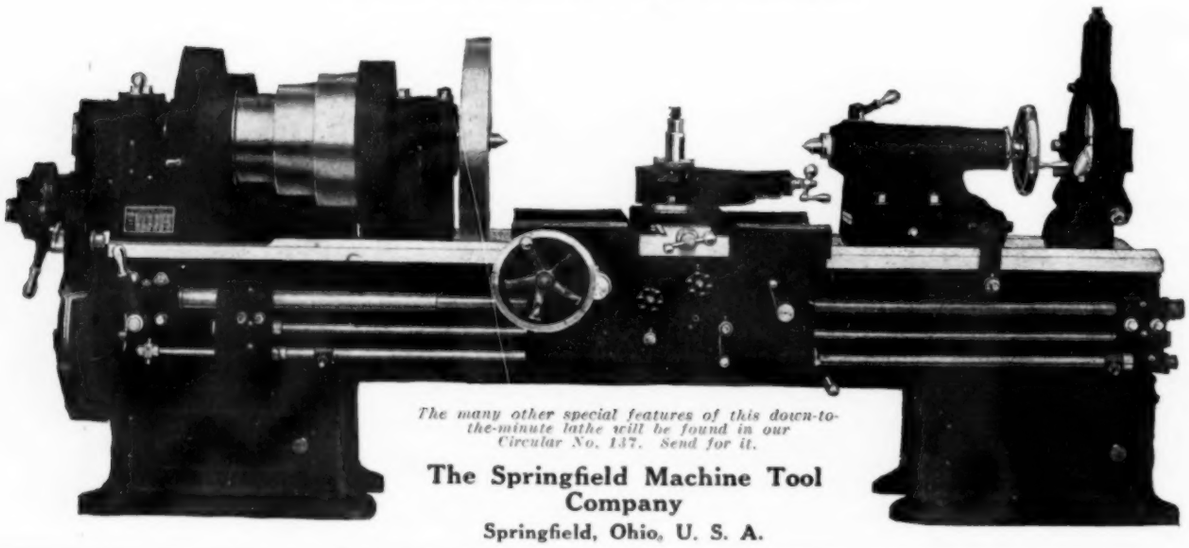
SPRINGFIELD

IDEAL
24-in. Geared Head Lathe

A Rugged Machine

The bed is deep and heavy. The headstock is massive, with self-oiling journals in which runs a spindle of extraordinary dimensions. Carriage is extra heavy with long bearing surface on bed.

It is equipped with a three-step cone and double back gears. The entire design embraces all the latest principles of construction



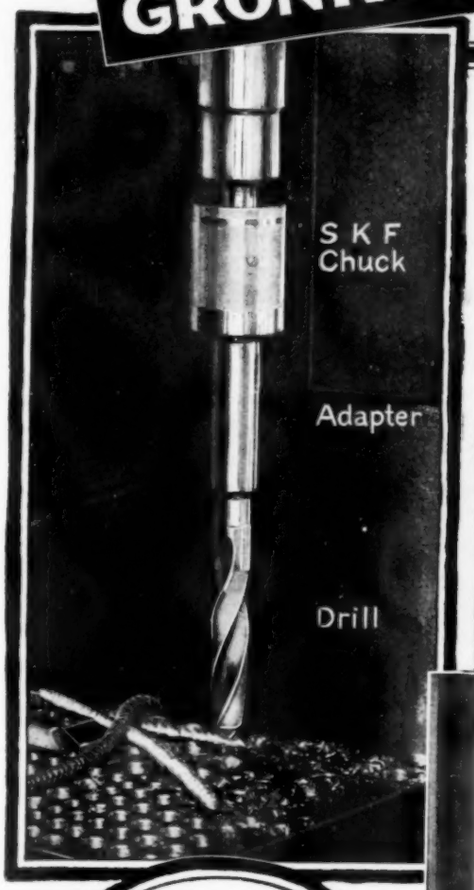
The many other special features of this down-to-the-minute lathe will be found in our Circular No. 137. Send for it.

The Springfield Machine Tool Company
Springfield, Ohio, U. S. A.

SKF GRONKVIST

QUICK ACTING AUTOMATIC DRILL CHUCK

Perfect Centering ~ Positive Grip



Greater Size Range With These Adapters—Without Impairing Accuracy or Grip

POSITIVE grip and accurate centering under strenuous tests prove it practical to use larger drills with an S K F Chuck by "setting up" an adapter combination.

Beyond the $\frac{3}{4}$-inch limit of the largest chuck itself (the No. 4), you can successfully manage drills up to $1\frac{1}{4}$ inches with an adapter. (See photograph.)

Nor could anything be simpler than such a set-up—no key, no wrench, no fumbling for elusive combinations. A twist of the wrist releases the S K F Drill Chuck to change drills or adapter sockets.

Once in place, the harder the drill turns, the tighter the roller jaws of the chuck grip. Accurate roller jaws and cams, positive in action, hold the drill true to accurate centering.

Send for Booklet

S K F INDUSTRIES, Inc.
165 Broadway, New York City

SKF INDUSTRIES

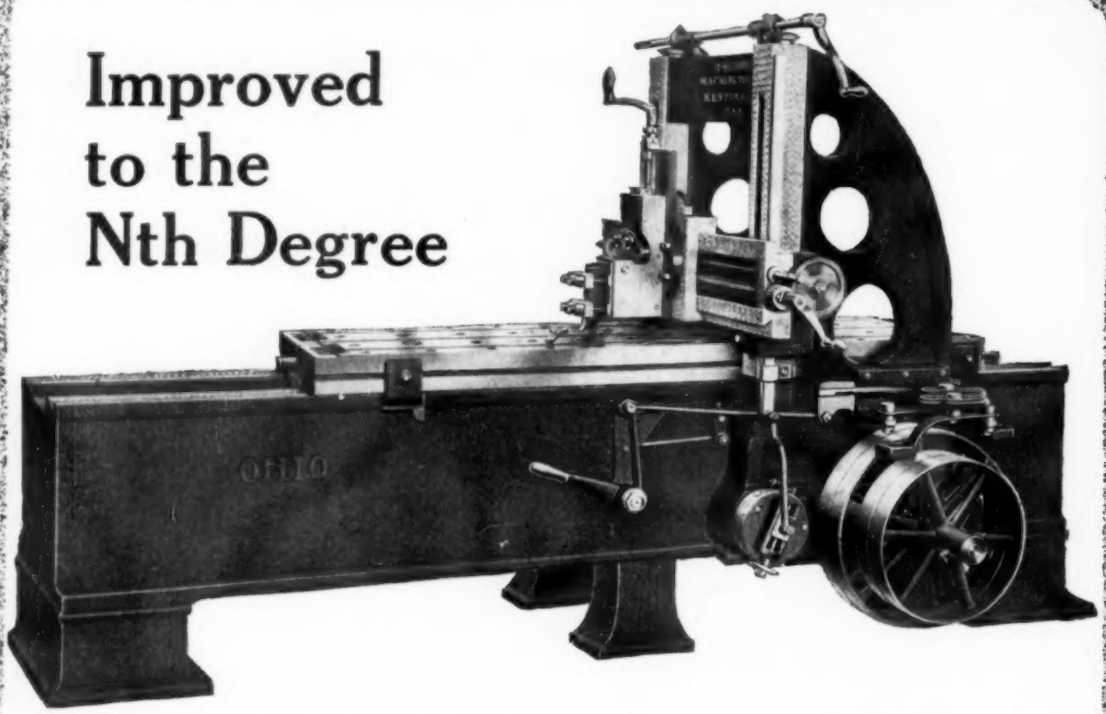
Hess-Bright Ball Bearings
S K F Ball Bearings
Atlas Steel Balls
Gronkvist Chucks
Transmission Hangers

OHIO

EXCLUSIVE FEATURES

SUPERIOR FEATURES

Improved to the Nth Degree



Improvements have been added to Ohio Planers until, today, they embody every necessary feature required in modern metal planing machines.

Unusually large bearing surfaces and massive, yet not bulky, construction give you a machine tool you cannot overtax. More than that, Ohios remain accurate and smooth running after years of continuous, severe service.

There is an Ohio Planer that will exactly meet your demands. They range from 22 x 22 in. to 48 x 42 in. We can furnish all sizes with any length of table; with one, two, three or four heads; with belt or motor drive.

You cannot afford to overlook Ohio Planer performance. It makes for economy in every planing department. Ask us to tell you how.

The Ohio Machine Tool Co., Leighton St., Kenton, O.

AGENCIES

AGENTS: Pittsburgh, Laughlin & Barney Machinery Company; Cleveland, W. M. Pattison Supply Company; Chicago, Dale-Brewster Machinery Company; Philadelphia and Baltimore, Luster Machinery Company; Toledo, Coghlin Machinery & Supply Company; New York City, Machine Tool-Engineering Company; Newark, N. J., Morris Machinery Company; Providence, Brownell Machinery Company; Hartford, Purinton & Smith Machinery Company; Boston, Factory & Mills Supply Company; Syracuse, H. A. Smith Machinery Company; Grand Rapids, McMullen Machinery Company; Detroit, English & Miller Machinery Company; St. Louis, W. L. Romaine Machinery Company (shapers); Milwaukee, Wis., Colcord-Wright Machinery & Supply Company; Indianapolis, Vonnegut Machinery Company; San Francisco, General Machinery & Supply Company; New Orleans, P. H. McArdle; Portland, Ore., Pacific Engineering & Equipment Company; Seattle, Westcoast Machinery Company; Los Angeles, Shaw, Palmer, Bakewell; Omaha, Sunderland Machinery & Supply Company; Salt Lake City, American Machinery Company; Milwaukee, Badger-Packard Machinery Company (planers).

"Planers and Shapers Since 1887"

FOR YEARS

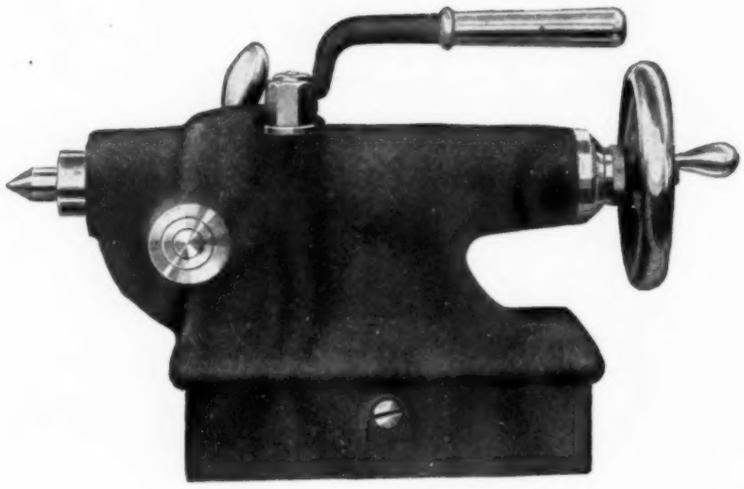
our advertisement has appeared on this page in The American Machinist. Could you, Mr. Reader, if asked off-hand what we manufacture, answer?

Cylinder Grinders, Internal Grinders, Surface Grinders, Magnetic Chucks.

THE HEALD MACHINE CO.

35 New Bond St.

WORCESTER, MASS.



A tailstock isn't much to talk about BUT—

much depends upon the tailstock of any lathe, and we wish to express the fine points of the tailstocks on Hamilton Rapid Production Lathes.

It is extra heavy. The spindle is made of good steel. The plug binder is graduated in eighths of an inch. Extra fine adjustments can be had thru the micrometer dial.

The tailstock may be set over for taper work, if desired and is graduated to indicate the central position and the amount of set-over. The tailstock screw runs in a bronze nut in the end of the spindle.

Rapid Production HAMILTON Machine Tools

Hamilton Rapid Production Lathes have a merited reputation for high quality of construction and great efficiency and economy in operation. Ask for our Lathe Bulletin.

THE HAMILTON MACHINE TOOL CO.

Hamilton, Ohio, U. S. A.

DOMESTIC AGENTS: Machineshop Equipment Corpn., Boston, Mass.; Barbour, Love & Woodyard, Inc., New York; Syracuse Supply Co., Rochester, N. Y., Syracuse, N. Y., Buffalo, N. Y.; Monarch Machinery Co., Philadelphia, Pa.; Thomson Machinery Co., Pittsburgh, Pa.; Co-operative Machinery Co., Cleveland, Ohio; Osborn & Sexton Machinery Co., Columbus, Ohio; Wolverine Machinery & Supply Co., Detroit, Mich.; Stocker-Rumely-Wachs Co., Chicago, Ill.; Thomson Tool & Supply Co., Indianapolis, Ind.; W. C. Johnson & Sons Machinery Co., St. Louis, Mo.; F. E. Satteriee Co., Minneapolis, Minn.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Herberts Machinery & Supply Co., Los Angeles, Calif.; Herberts Machinery & Supply Co., San Francisco, Calif.; M. J. Walsh Machinery Co., Milwaukee, Wis.; Textile Mill Supply Co., Charlotte, N. C.; General Fire Extinguisher Co., Atlanta, Ga.; Oliver H. Van Horn, Inc., New Orleans, La.
CANADIAN AGENTS: H. W. Petrie, Ltd., Toronto, Ont., Canada.

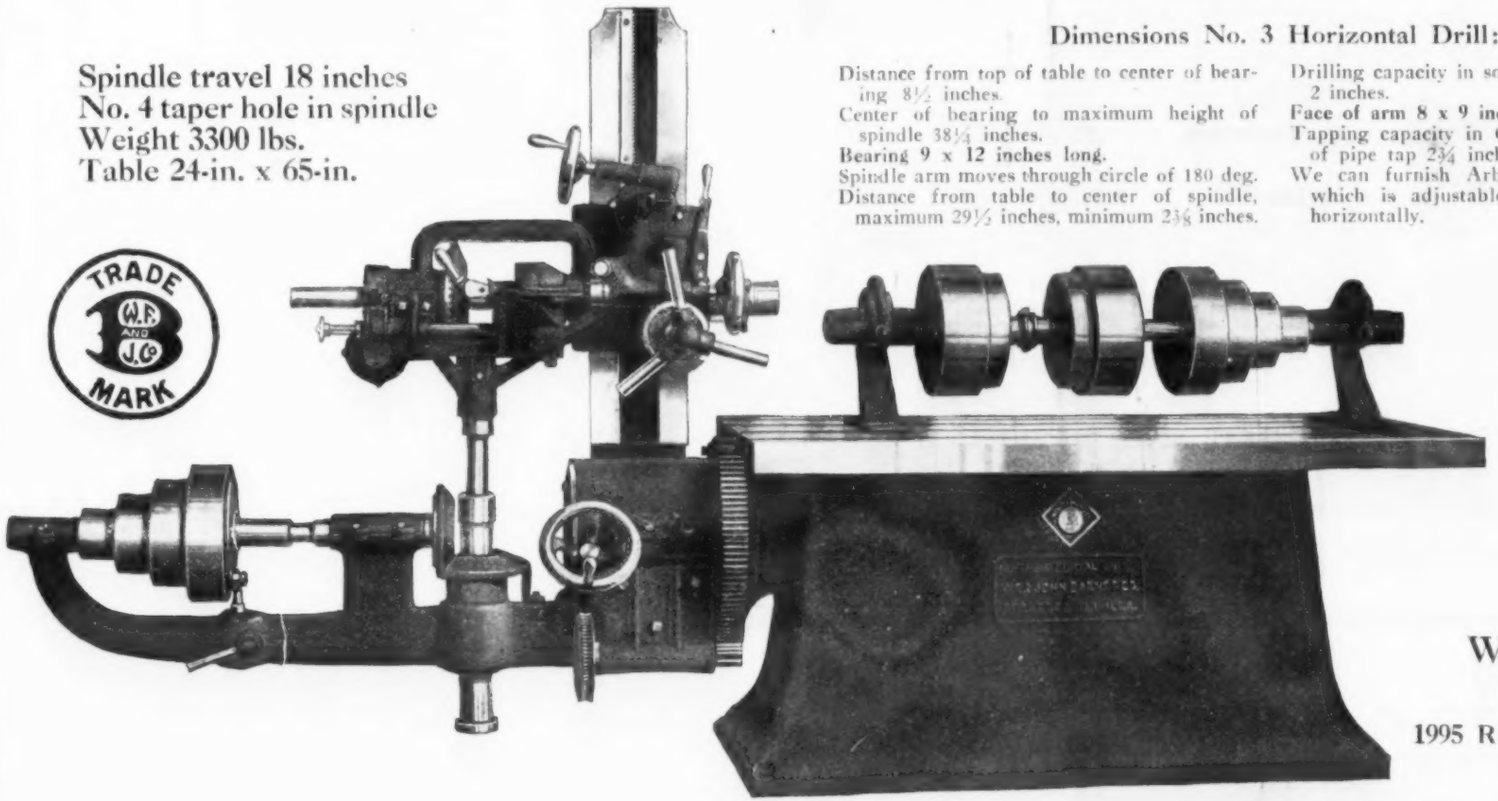
BARNES RADIAL DRILL

We illustrate herewith a No. 3 Horizontal Radial Drill or End Drilling and Tapping Machine. The machine is back geared, strong and well built and all parts are within easy reach of the operator. The table is slotted for holding the work; the arm is of heavy box pattern, and the sliding head is gibbed strongly on the square ways of the arm. For operating the spindle, the operator has the choice of three feeds, namely, the lever feed or the hand wheel feed or the power feed. Power feed has positive drive.

Spindle travel 18 inches
No. 4 taper hole in spindle
Weight 3300 lbs.
Table 24-in. x 65-in.

Dimensions No. 3 Horizontal Drill:

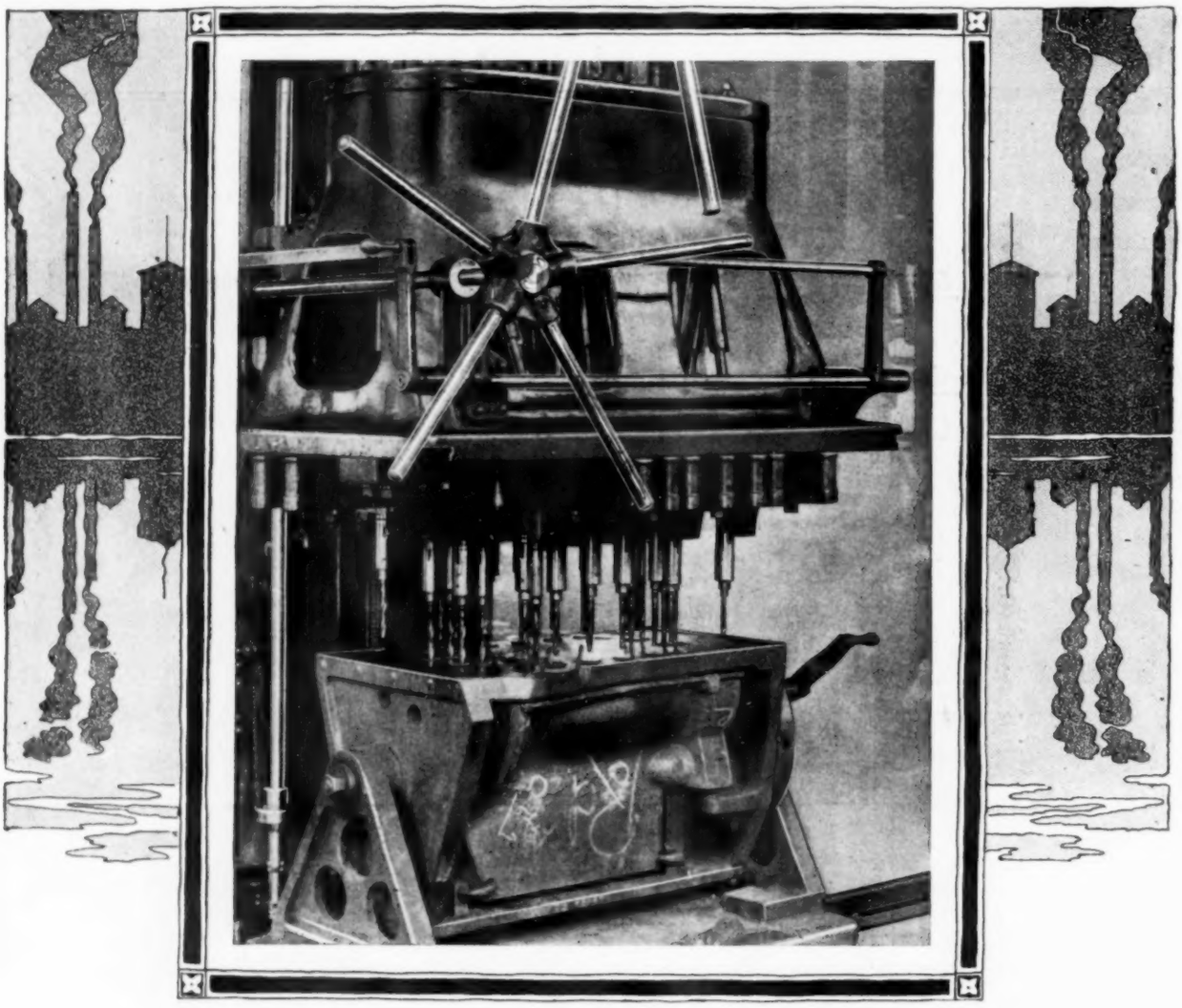
Distance from top of table to center of bearing 8½ inches.
Center of bearing to maximum height of spindle 38¼ inches.
Bearing 9 x 12 inches long.
Spindle arm moves through circle of 180 deg.
Distance from table to center of spindle, maximum 29½ inches, minimum 2⅜ inches.
Drilling capacity in solid C.I. 3 inches, Steel 2 inches.
Face of arm 8 x 9 inches.
Tapping capacity in C.I. 3 inches; capacity of pipe tap 2¾ inches.
We can furnish Arbor Rest (extra cost) which is adjustable both vertically and horizontally.



W. F. and John Barnes Co.

1995 Ruby St., Rockford, Ill.

MULTI-DRILLERS THE "HOLE" STORY NATCO MULTI-TAPPERS IN ONE WORD



NATCO MULTI-DRILLER

The solution to rising production costs

Production costs are soaring more and more each month. The Natco Multi-Driller helps you meet them by reducing drilling costs.

This Natco Multi-Driller drills a total of sixty holes in the top, sides and bottom of each cast iron cylinder block, like the one shown, at the plant of Root and Vandervoort Co., of East Moline, Ill. Sizes and depth of holes are as follows: Twelve 13/32-in. ½-in. deep, six ½-in. ½-in. deep, ten ¾-in. 1-in. deep, two ¼-in. ⅜-in. deep, eight 27/64-in. 1½-in. deep, two 9/16-in. ⅝-in. deep, four 5/16-in. ½-in. deep, four 45/64-in. ¾-in. deep, nine 17/64-in. ⅜-in. deep, one 13/64-in. ¼-in. deep, one 7/16-in. ½-in. deep, and one 23/64-in. 1¼-in. deep. These cylinder blocks are completed at the rate of 14 per hour using fixtures on a track system.

These people are enjoying big saving over the use of single spindle radial drills with Natco Multi-Drillers. The ratio of saving on this work is about 15 to 1. Each spindle operates independently of each other on a Natco Multi-Driller —a feature which permits simultaneous operation of the tools each at its correct cutting speed. Large and small holes can be drilled, reamed, counterbored, spotfaced or tapped all at the same time. No other machine has this feature. It's patented!

Natco Multi-Drillers are built in eleven sizes from 2 to 72 spindles.

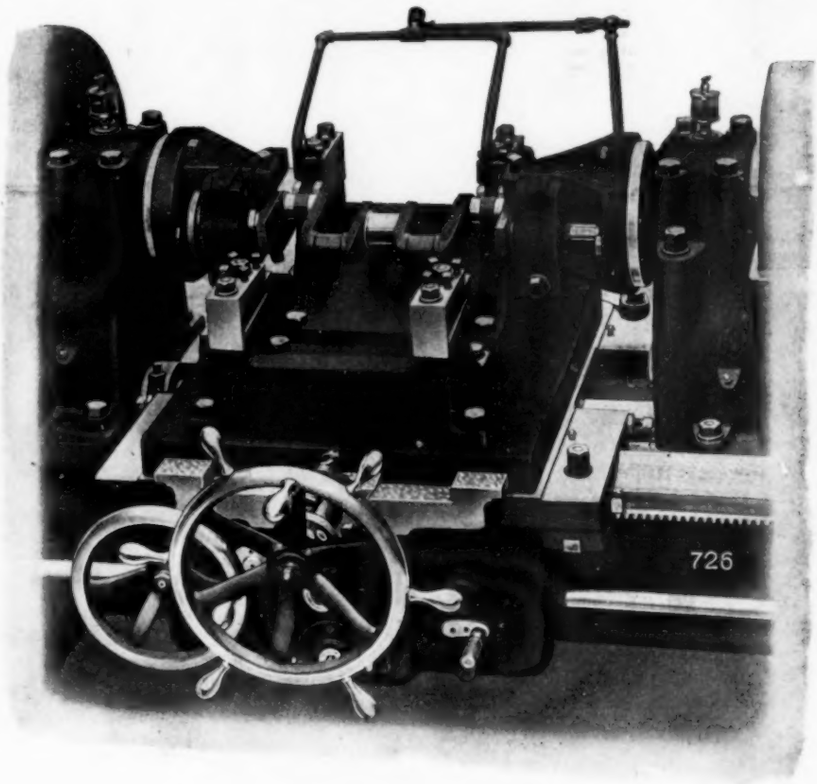
We also make jigs and fixtures for use in connection with Natco Multi-Drillers.

The National Automatic Tool Company, Richmond, Indiana, U. S. A.

List of NATCO Domestic and Foreign Agents

Henry Prentiss & Co., New York City; Buffalo, N. Y.; Boston, Mass.; Syracuse, N. Y.; Rochester, N. Y.; Hartford, Conn.; Scranton, Pa. W. E. Shipley Machinery Co., Philadelphia, Pa. Motch & Merryweather Mchry. Co., Pittsburgh, Pa.; Cincinnati, Ohio. Strong, Carlisle & Hammond Co., Cleveland, Ohio; Detroit, Mich. Marshall & Huschart Mchry. Co., Chicago, Ill.; Milwaukee, Wis. Burton, Griffiths & Co., British Isles; E. Isbecque Co., Belgium; Aux Forges De Vulcain, France; Allied Machinery Company of America, Italy, Spain, Portugal and Switzerland; Chr. A. Herstad, Norway, Sweden and Denmark.

Turning Crankshafts by the DUPLEX METHOD



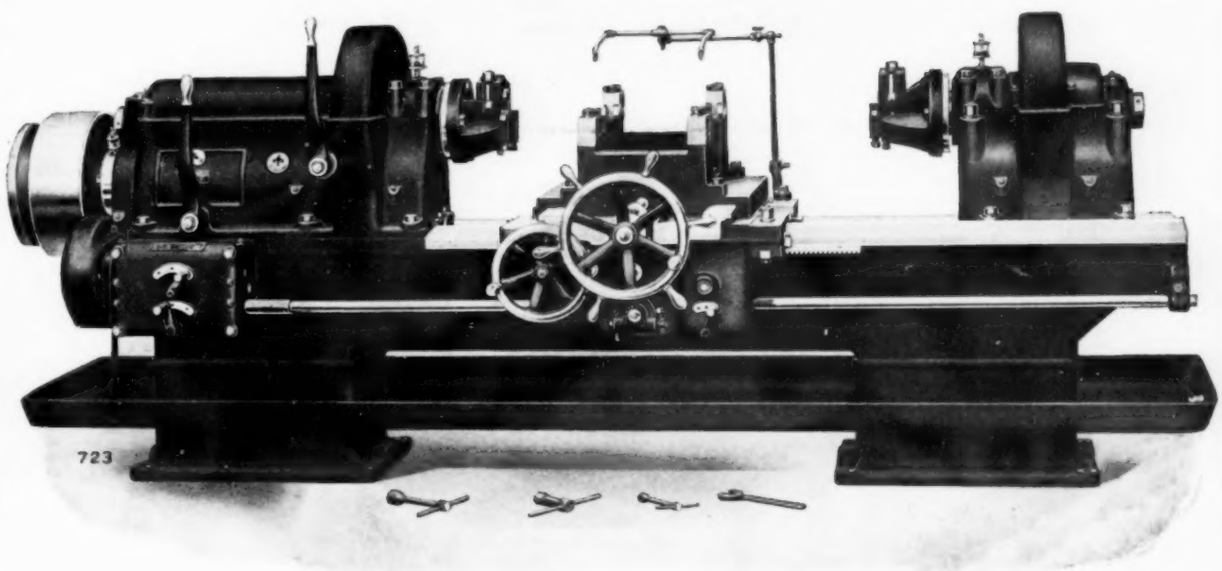
The equipment consists of two Duplex Crank Lathes tooled for the outside and the adjacent pins.

The two pins in the same plane are turned simultaneously, the front tools turning the pin and the rear tools forming the fillets. Positive stops limit the travel of the slide to insure duplication of sizes and a uniform grinding allowance.

The fixtures are provided with quick acting, hinged clamps to facilitate the removal of the finished crank.

The head and tailstock are power driven to prevent torsional strains in the crank.

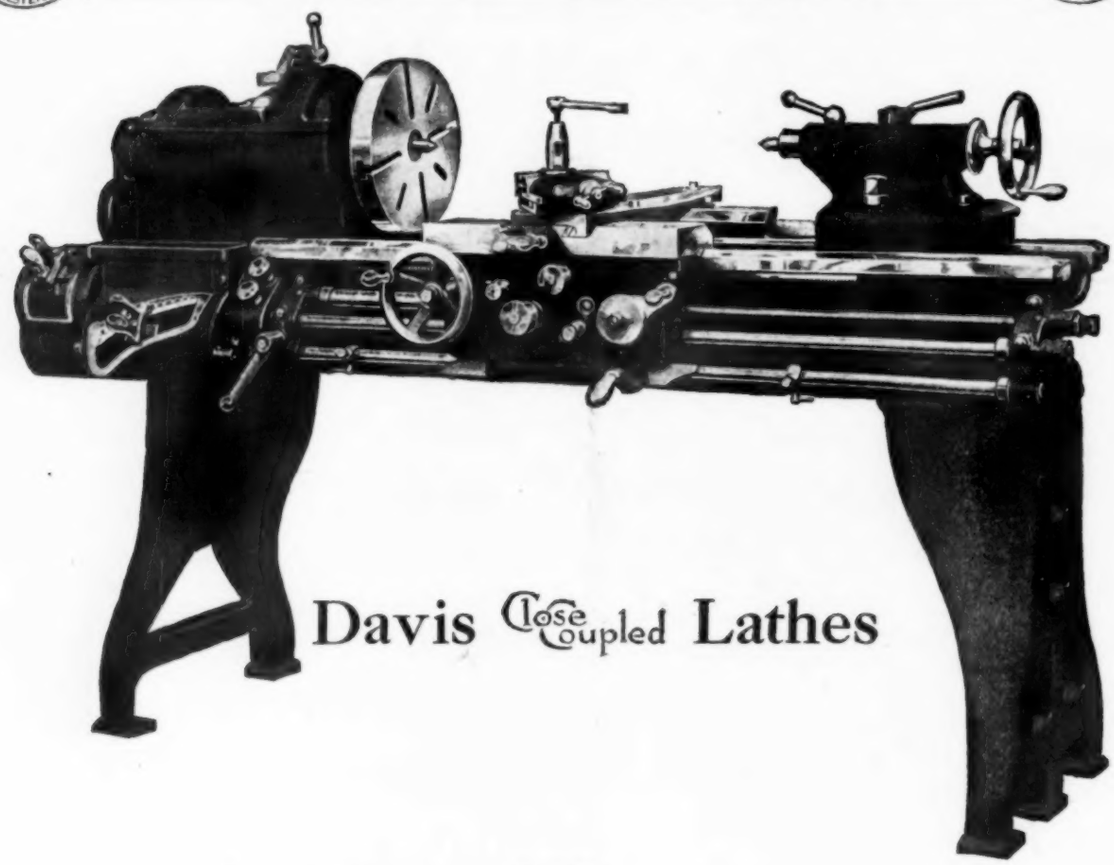
The average time per pair of pins is two minutes.



The R.K.Le Blond Machine Tool Co.

Cincinnati.Ohio.

ACCURACY—SIMPLICITY—SERVICE



Davis Close Coupled Lathes

An Actual Occurrence

Recently a prospective customer was inspecting a "Close Coupled" Lathe standing on the floor of one of our agencies in a busy New York State City. After thoroughly examining each feature, as he thought, he finally ejaculated, *"I'd buy that lathe if it had Back Gears."*

It is not surprising that he received this wrong impression because none are to be seen where back gears usually are found.

But it *has* Back Gears. They are located in an unusual but nevertheless the logical position—for greatest power—directly under the spindle and Close Coupled, avoiding the long back shaft and the attendant torsional strains found in other designs. Furthermore these back gears are thrown "in" and "out" by means of a convenient lever at the right of the gear box.

Our catalog gives a sectional view taken vertically through the headstock showing the construction and explains the other features exclusive to this lathe. It will pay you to write for a catalog.

DAVIS MACHINE TOOL CO., Inc. **Rochester, N. Y., U. S. A.**

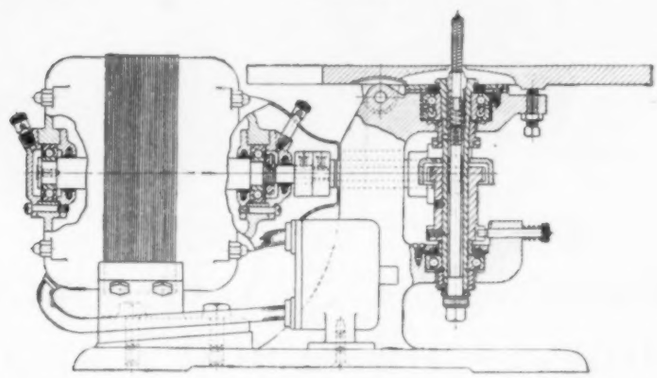
New Departure Ball Bearings

NEW DEPARTURE BALL BEARINGS
AND THEIR UNIVERSAL APPLICATION

ENGINEERING INFORMATION
Issued at frequent intervals to show practical mountings of New Departure Ball Bearings for securing correct installation, operating efficiency and economical service.
Published by Engineering Department

PLEASE FILE — BINDER ON REQUEST

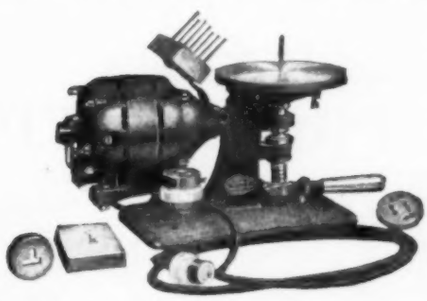
NEW DEPARTURE MFG CO BRISTOL, CONN. No. 126 FE



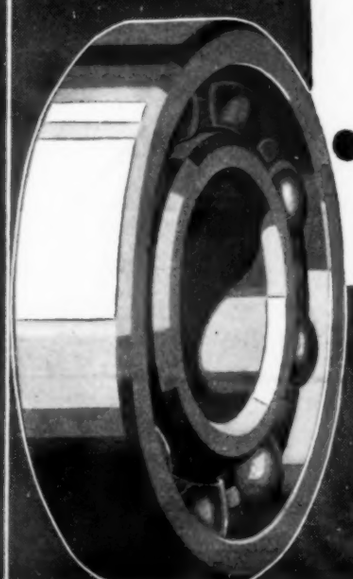
Die Forming Machine.

"The above machine and cutters, while primarily designed for finishing blanking dies, will be found useful in the production of irregular shaped drawing dies and templates, small sheet metal model parts, formers for profiling machines, irregular shaped gages, formers for cams, metal and small wood patterns and threading dies.

"Advantages secured by the use of this machine, as compared with a reciprocating filing machine, for finishing blanking dies are as follows: Work drawn down on table or platen; a wide range of surface contours finished without change of cutters; surfaces finished with uniform degree of clearance regardless of direction from which work is applied to cutter; chips carried downward, not deposited on top of the die to obscure the pattern or layout; will remove very much more material in a given time than is possible with a reciprocating file.



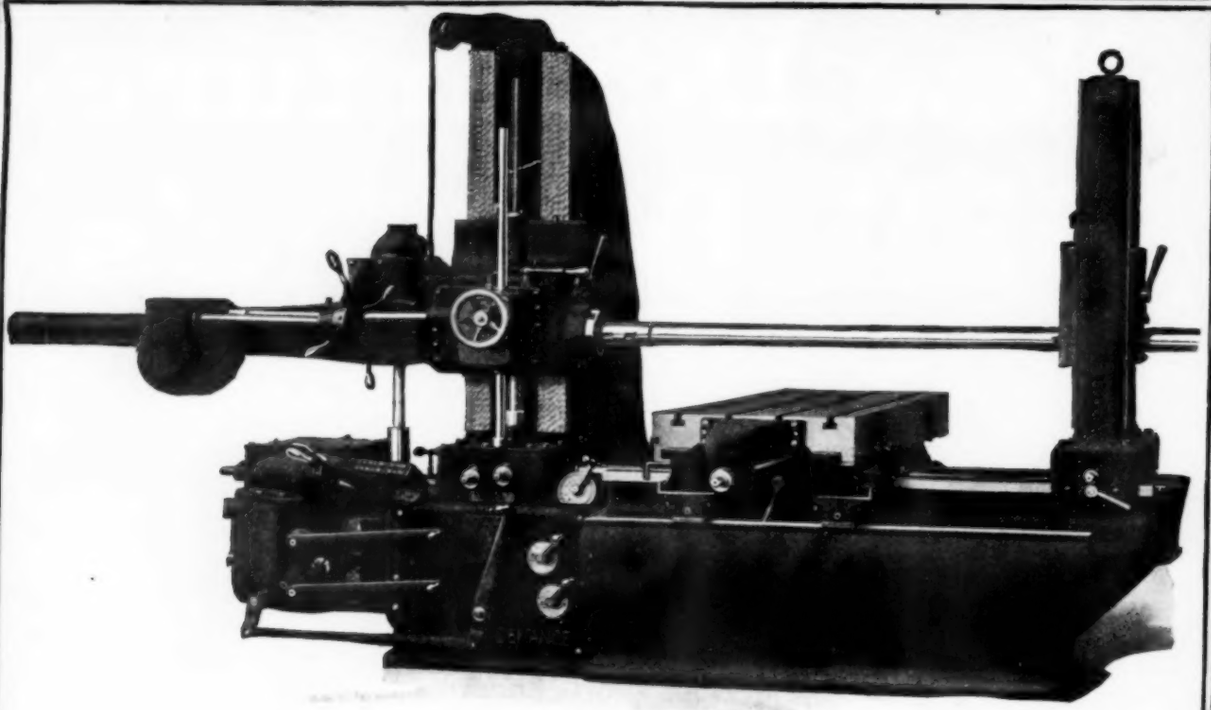
"In order to secure proper and uniform clearance on all sides of the die, the cutter is made to taper. The table is adjusted at right angles to the



"This binder is my most prized reference book"—
a designer for General Electric Company.

If you have occasion to apply ball bearings to machines, you will find this set of Engineering Data Sheets invaluable. Write for them on your letterhead.

THE NEW DEPARTURE MANUFACTURING CO
Detroit BRISTOL, CONN. Chicago



Defiance No. 5-A Horizontal Boring, Milling, Drilling and Tapping Machine

WITH SADDLE SUPPORTED BY OUTBOARD BEARINGS

DESIGNED AND BUILT FOR RAPID PRODUCTION AND PRECISION

3 SIZES FOR BELT OR MOTOR DRIVE

Features

1. All Parts Easily Accessible.
2. Splash and Gravity Oiling System.
3. Speed and Feed Mechanism — Contents of Spindle Head Are Unit Construction.

The Defiance Machine Works

DEFIANCE, OHIO, U. S. A.

NEW-YORK LONDON

If It Can't Boost Your Output— Nothing Can Do It

That is one thing sure. We say this because we know what Betts-Bridgeford Heavy Duty Lathes have been doing for others for nearly a quarter of a century. These machines are so modern in design and so honestly constructed they cannot fail to give you long and economical service.

A glance at the one shown below will give you some idea of their rigid construction. All speed changes are obtained through hardened steel sliding gears and positive clutches running in oil. No two speeds can be engaged at the same time. Feeds and leads are interlocking. The apron is of the double-wall unit-casting construction.

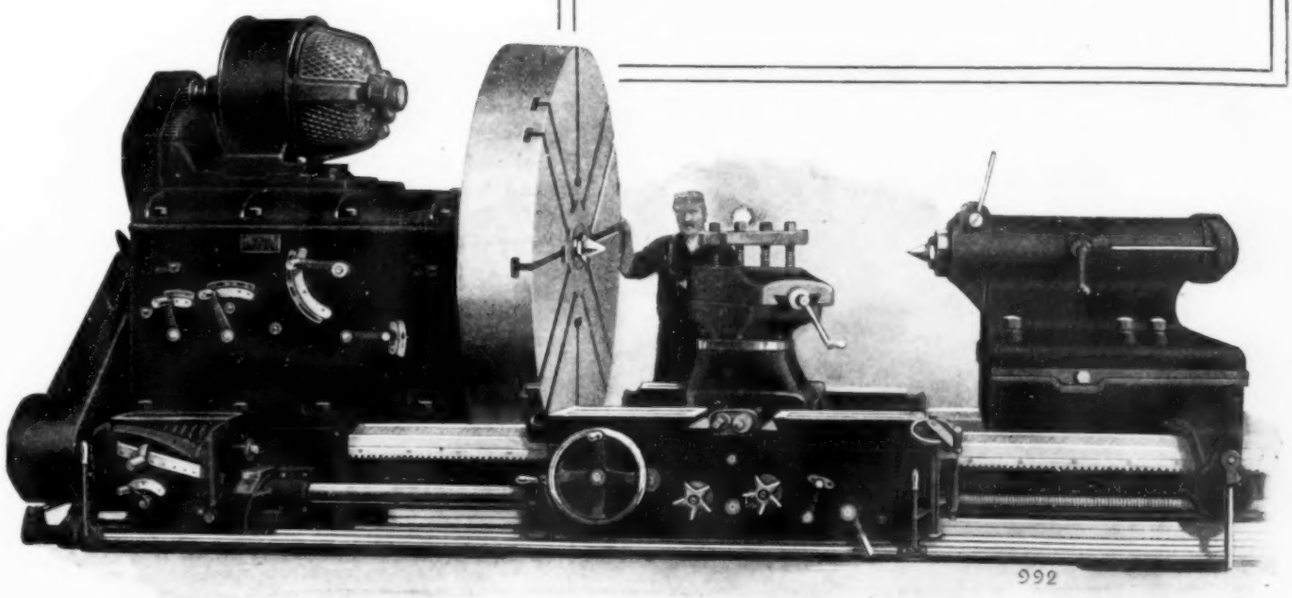
Both feeds and leads may be reversed either at the headstock or at the apron.

But to learn about all the good points you will have to let us send you our heavy duty lathe bulletins. May we do it?

Betts Machine Company

402 Blossom Road, Rochester, N. Y.

Betts - Bridgeford 72 - Inch Swing Geared Head Heavy Duty Motor Driven Lathe.



A Quick-acting, easily controlled BORE GRINDER

For Short, Straight or Taper Hole Work

It's the—

VAN NORMAN No. 34

Wheel and Work Head Slides closed up and locked in operating position.

Look no further for a machine to handle that short, straight or taper hole work of yours.

This Van Norman No. 34 Automatic Bore Grinder has shown its value to concerns in all parts of the country. It is convenient, simple, fast and economical.

The No. 34 has the same refinements of automatic cross feed and cutout mechanism as are employed in the well-known Van Norman Oscillating Grinder.

A single movement of one hand lever and latch disconnects feed mechanism and withdraws the cutting wheel; while the action of the other lever displaces the work head at right angles to the wheel spindle, giving clear way for testing or loading.

Just as quickly and simply are the positions reversed.

Both the Work Holding Head and the Grinding Wheel Head are mounted directly over the base, thus maintaining a substantial foundation.

Let us know the kind of work you are doing and we'll let you know what we can do in the way of economy for you.

Van Norman Machine Tool Company

Office and Factory: **150-200 Wilbraham Ave., Springfield, Mass., U. S. A.**

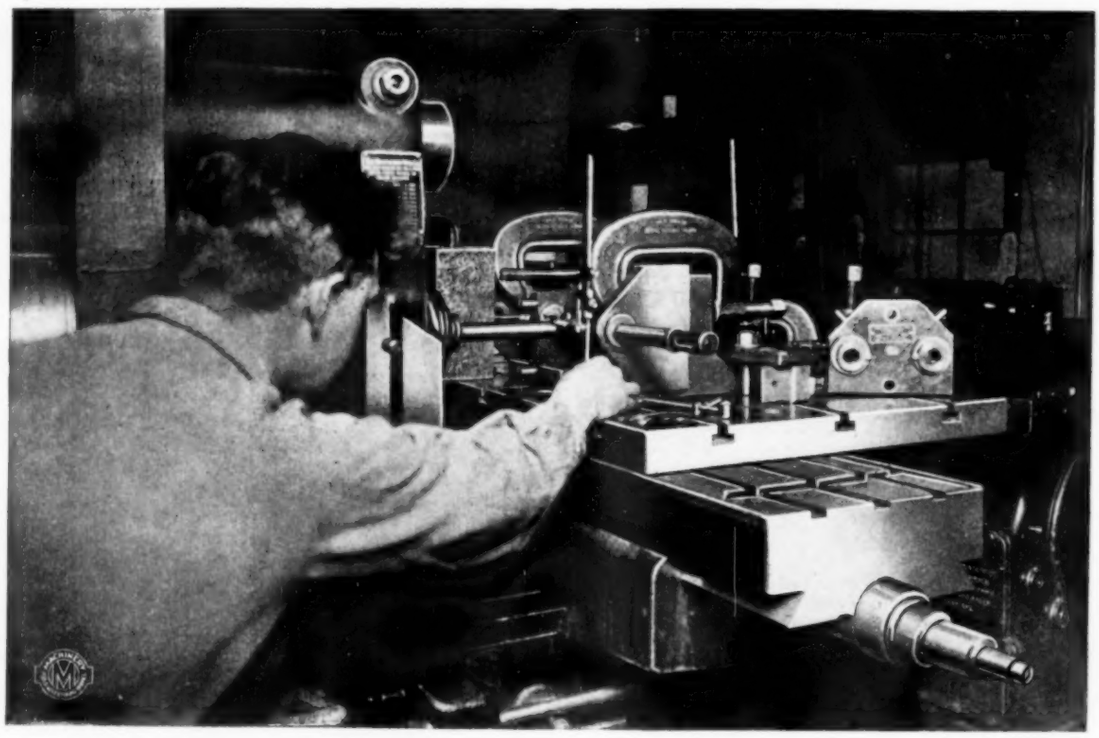
Branch Sales Offices:
74 Brush Street, Detroit
50 Church Street, New York

Agents for Great Britain, Alfred Herbert, Ltd. Agents for France, F. Auberty & Co.

Wheel and Work Head Slides opened out, by hand levers, for loading and testing work.

KEMPSMITH

Selected for the More Important Work



KEMPSMITH MILWAUKEE, U.S.A.

There Are Twenty-Five In This Plant On Jig Work Alone

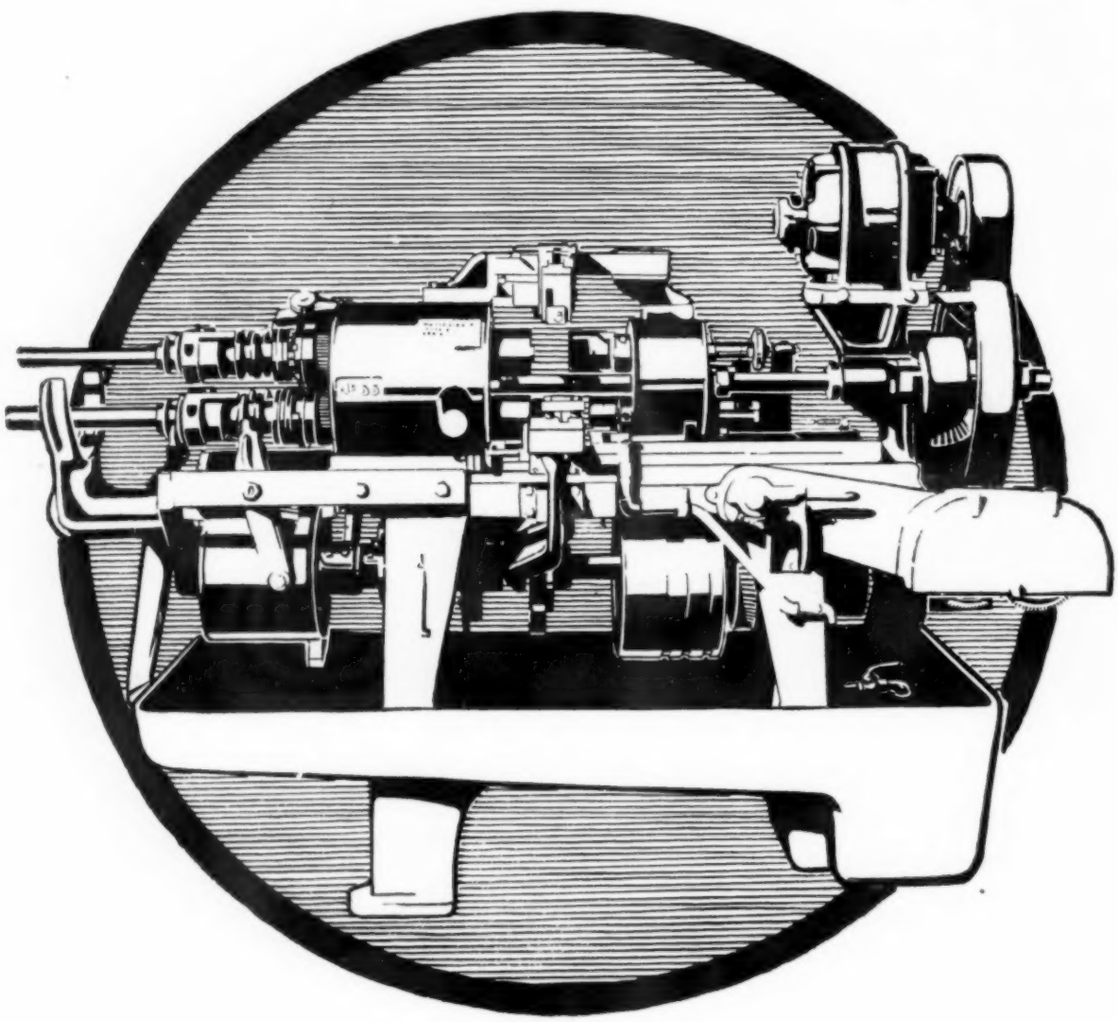
THIS is but one of many jobs which John Bath & Company, Inc., of Worcester, Mass., performs on KEMPSMITH MILLERS. This machine is the choice here for jig work, which must combine production and precision. The test plug is being lined up with a hole in the jig preparatory to locating and boring another hole at right angles to it. The ten holes, varying from $\frac{3}{8}$-in. to $1\frac{1}{4}$-in., are located and bored on the KEMPSMITH—and this work must be performed with extraordinary precision, no measurable error being permitted. May we send you literature?

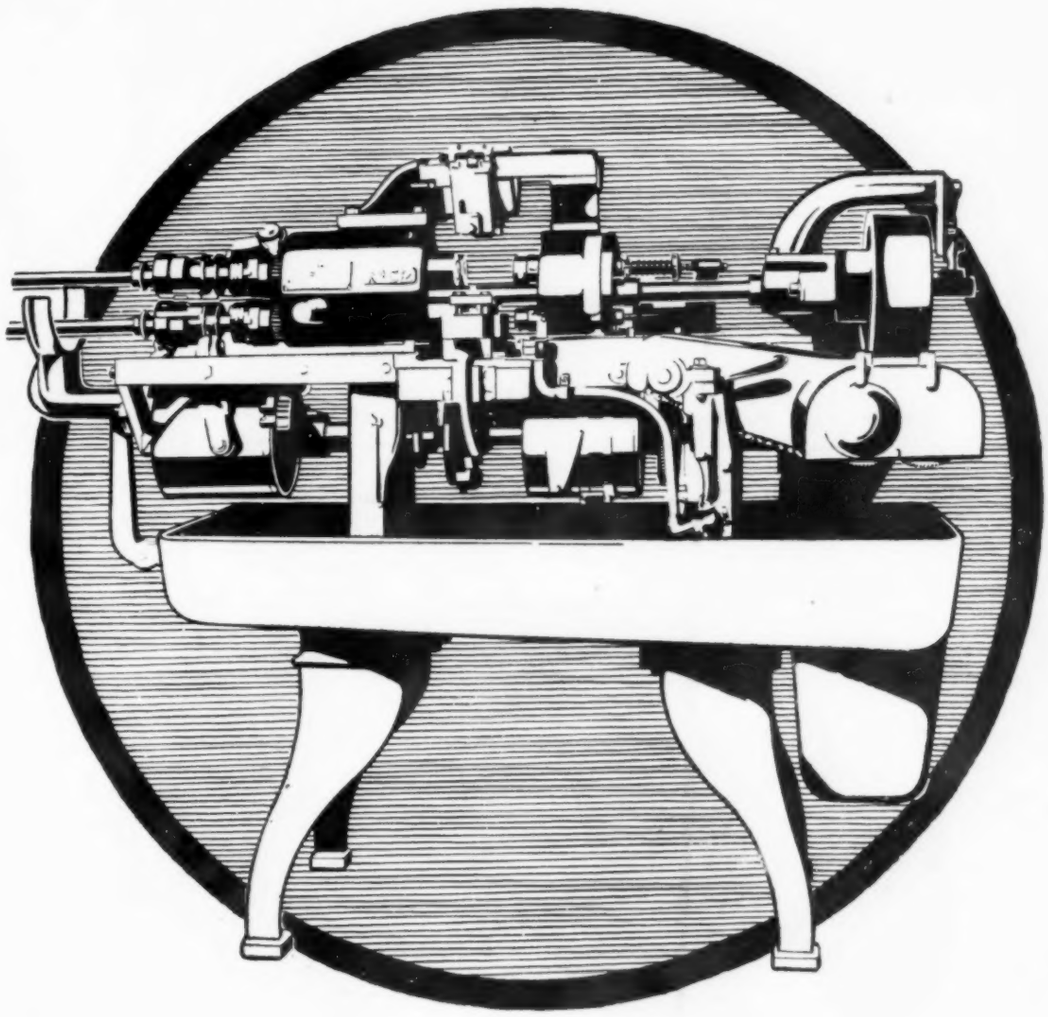
DOMESTIC DEALERS: Biggs-Watterson Co., 1235 West 9th St., Cleveland, O.; Brownell Machinery Co., 11 Eddy St., Providence, R. I.; Cadillac Tool Co., 268 Jefferson Ave., Detroit, Mich.; Carolina Supply Co., Greenville, S. C.; Eccles & Smith, 40 Front St., Portland, Ore.; E. L. Essley Machinery Co., 555 Washington Blvd., Chicago, Ill.; E. L. Essley Machinery Co., 222 Grand Ave., Milwaukee, Wis.; Fairbanks Co., cor. Light and Lombard Sts., Baltimore, Md.; Fairbanks Co., 325 Colorado Bldg., Washington, D. C.; Fairbanks Co., 636 Builders' Exchange, Minneapolis, Minn.; National Supply Co., Toledo, Ohio; Osborne & Sexton Machinery Co., Columbus, Ohio; Salt Lake Hardware Co., Salt Lake City, Utah; Smith-Booth-Usher, 228 Central Ave., Los Angeles, Cal.; Smith-Courtney Co., Richmond, Va.; H. A. Smith Machinery Co., 501 E. Water St., Syracuse, N. Y.; Somers, Fitler & Todd, 329 Water St., Pittsburgh, Pa.; Homer Strong, 301 State St., Rochester, N. Y.; Homer Strong, Ellicott Sq. Bldg., Buffalo, N. Y.; Taylor Machinery Co., 78 Batterymarch St., Boston, Mass.; Thomson Tool & Supply Co., Odd Fellows' Bldg., Indianapolis, Ind.; Vandyck-Churchill Co., Singer Bldg., Liberty St., New York, N. Y.; Vandyck-Churchill Co., 734 Widener Bldg., Philadelphia, Pa.; Vandyck-Churchill Co., 808 First National Bank Bldg., New Haven, Conn.; Fred Ward & Son, 171 First St., San Francisco, Cal.; Fulton Supply Co., Atlanta, Ga.; Fairbanks Co., 115 So. 11th St., St. Louis, Mo.; P. H. McArdle, 713 Carondelet St., New Orleans, La.

FOREIGN DEALERS: American Trading Co., Tokyo, Japan; Barandiaran & Co., 3, Alemeda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117-129 King St., Melbourne, Australia; Edgar Bloxham, 12 Rue du Delta, Paris, France; Geo. F. Foss Machinery Co., 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Ont., Canada; General Supply Co., 356 Sparks St., Ottawa, Ont., Canada; Nielson & Winther, Blegdamsvej, 60 Copenhagen, Denmark; Parke & Lacy Co., 60 Clarence St., Sydney, N. S. W., Australia; Selson Engr. Co., 85 Queen Victoria St., London, E. C., England; Selson Engr. Co. (Italy) Ltd.; Corso Vittoria Emanuele, 9, Turin and Piazzo Castella, 5, Milan, Italy; Spliethoff Beeuwkes & Co., Leuvehaven, W. Z., 159, Rotterdam, Holland; Societe Anonyme Belge Alfred Herbert, 35 Rue de Laeken, Brussels, Belgium.

ACME MULTIPLE SPINDLE AUTOMATICS

Are you interested in lowering your unit production costs? Present day material and labor costs, demand that this question be given frequent consideration. We suggest the possibilites, offered by ACME AUTOMATICS, not as an experiment but as a tried and tested material and labor saving development.





Discarding costly hand-machine methods in duplicate part production means more than throwing the machines in the scrapheap. It means replacing them with accurate and speedy methods—fully automatic fast production time and the lowest cost per piece.

Acmes may help you. At least, send for our descriptive catalog.

Built in capacities to handle bar stock up to 4-in. in diameter

The National Acme Company

NEW ENGLAND PLANT
WINDSOR, VT.

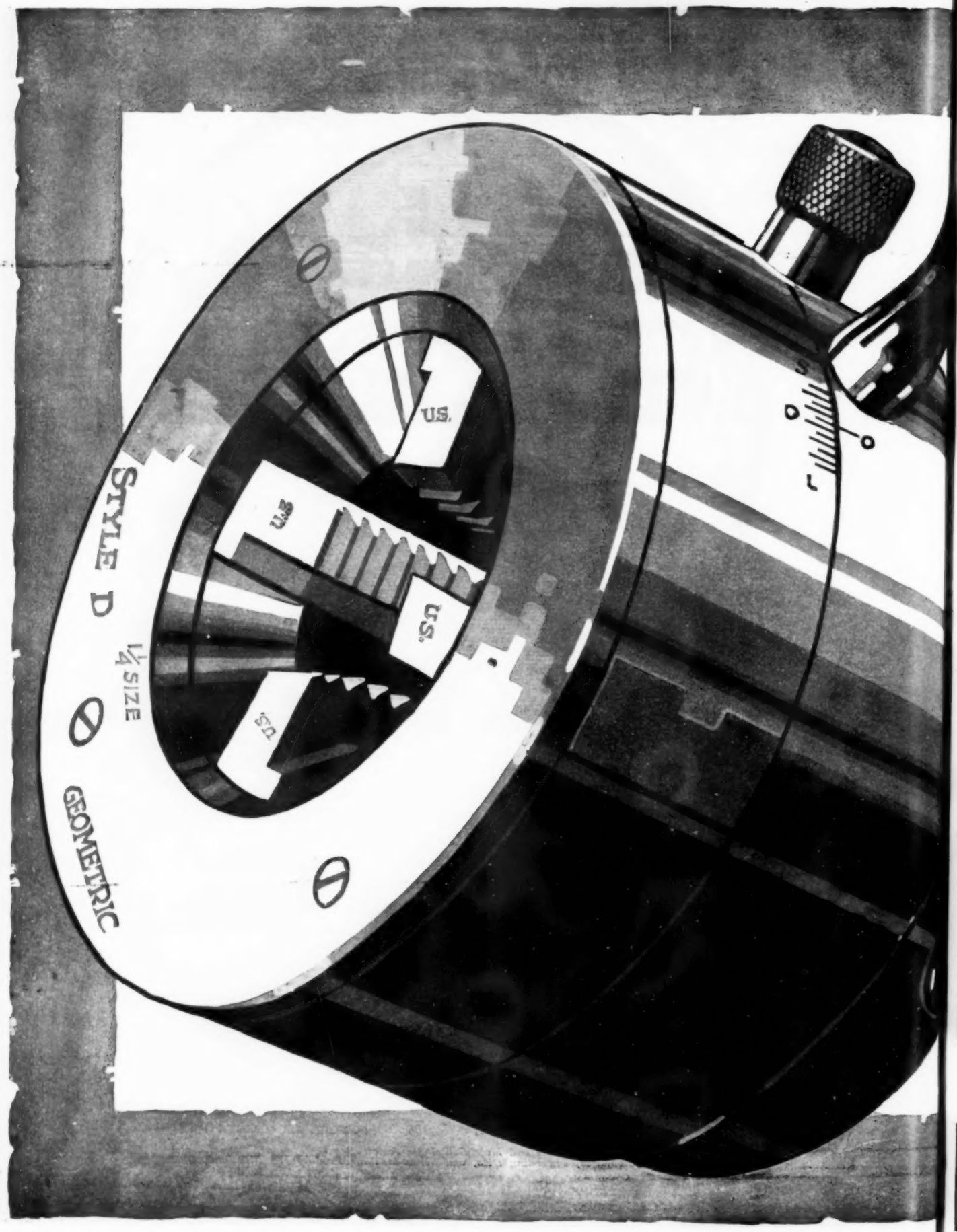
CLEVELAND, OHIO

CANADIAN SCREW PLANT
MONTREAL, P. Q.

Branch Offices

NEW YORK BOSTON CHICAGO DETROIT ATLANTA SAN FRANCISCO
WAREHOUSES: NEW YORK and CHICAGO FOREIGN REPRESENTATIVES

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw-Machine Products at Cleveland, Ohio


STYLE D
1¼ SIZE
GEOMETRIC
U.S.
U.S.
U.S.
U.S.

He Decided To Try An Experiment

This incident illustrates the possibilities of Geometrics in your plant. One economy with Geometrics suggests others.

The foreman of the Second Street shops of the Moore Shipbuilding Co., San Francisco, got an idea one day that made the management sit up and take notice.

He decided to try an experiment to see if he couldn't get as high a rate of production on large studs as on smaller ones that were being threaded the Geometric way. Getting busy, he installed the largest automatic opening adjustable die head in use in the 'Frisco Bay district—a Geometric, of course—for threading 3½-in. diameter studs.

Result: Actual threading time per stud reduced from 14 to 4 minutes.

Furthermore, the micrometer adjustment feature of the Geometric made the studs fit the tapped holes exactly.

Write us for any information you want about Geometric Special Threading Tools

The Geometric Tool Company

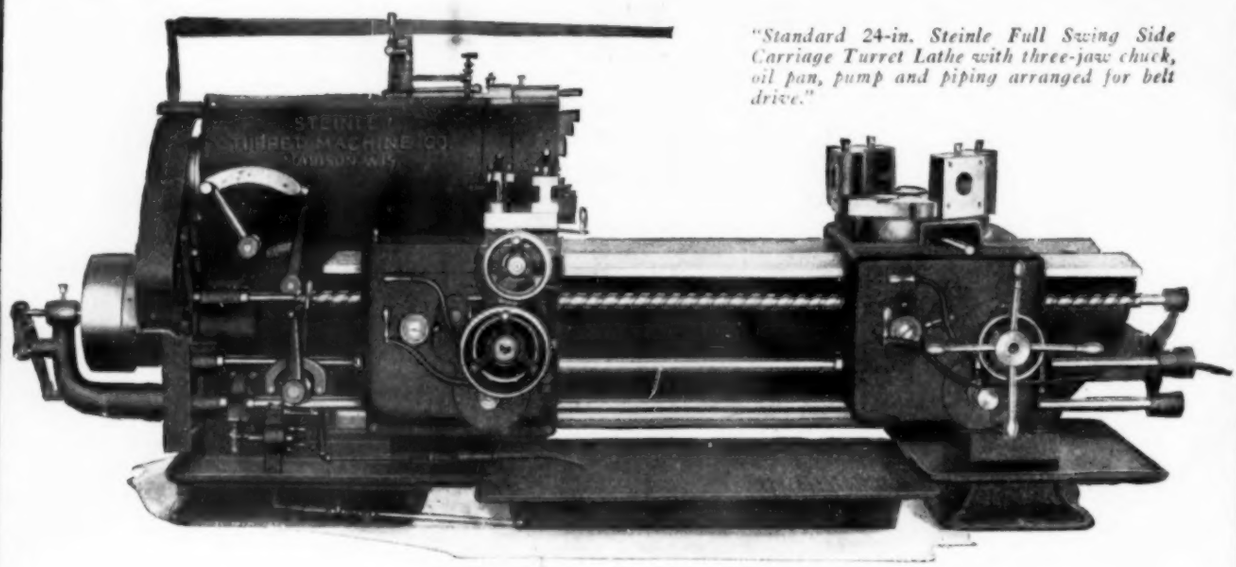
New Haven, Conn., U. S. A.

Chicago Office: 627 West Washington Blvd.

General Distributors of Michigan, The Chas. A. Strelinger Co., Detroit; Western Sales Agents, The Tool Equipment Co., San Francisco; Blackman-Hill McKee Mchy. Co., St. Louis, Mo.; Hill, Clarke & Co., Inc., Boston; Kemp Machinery Co., Baltimore Md.; The National Supply Co., Toledo, Ohio; The W. M. Pattison Supply Co., Cleveland Ohio; Root, Neal & Co., Buffalo, N. Y.; F. E. Satterlee Co., Minneapolis, Minn.; Somers, Fitler & Todd Co., Pittsburgh, Pa.; Vandyck Churchill Co., New York and Philadelphia; Vonnegut Machinery Co., Indianapolis, Ind.; The C. H. Wood Co., Syracuse, N. Y. CANADA: The Canadian Fairbanks-Morse Co., Ltd., Manitoba, Sackatchewan and Alberta; The A. R. Williams Mchy. Co., Ltd., Toronto, Winnipeg and St. John (N. B.); Williams & Wilson, Ltd., Montreal. FOREIGN: Allied Mchy. Co. of America, France, Italy, Switzerland, Spain, Portugal; Andrews & George, Tokyo, Japan; Bevan & Edwards, Melbourne; Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Glasgow; J. Horstmann, Paris; E. Isbecque & Co., Brussels, Belgium; V. Lowener, Denmark, Norway, Sweden (Copenhagen, Christiania, Stockholm); R. S. Stokvis & Zonen, Rotterdam, Holland; White & Rae, Sydney.

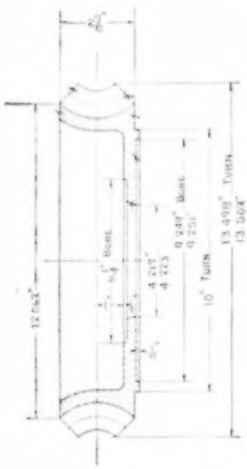
STEINLE

Full Swing Side Carriage Turret Lathes



"Standard 24-in. Steinle Full Swing Side Carriage Turret Lathe with three-jaw chuck, oil pan, pump and piping arranged for belt drive."

Chucking Problems for Steinle Solution



In a large New England plant a battery of six Steinles is engaged in producing a wide range of parts of which the one shown is a representative illustration of the rapid production obtained.

The gear is of cast iron and the operations completed include boring, counterboring, forming, shoulder, facing both sides of rim and forming gear diameter.

PERFORMANCE COUNTS and that is why this manufacturer has just ordered two more Steinles.

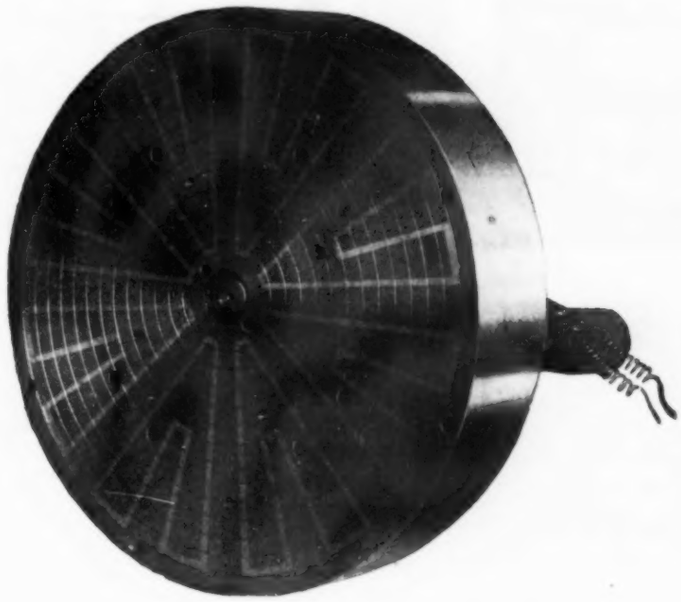
"Send us drawings of your work so that our Engineering Department can estimate "Steinle" production, or ask to have a representative call upon you to determine what work can be produced to advantage on our machines."

Steinle Turret Machine Company

Originators of the Full Swing Side Carriage Turret Lathe

Madison, Wis., U. S. A.

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.



Leadership That Pays

Eighteen years ago, when thin work was set in wax and flat grinding work was held with jaw chucks, The O. S. Walker Co. started to manufacture magnetic chucks.

From the very outset of the magnetic chuck entry into the commercial world, The O. S. Walker Co. has fastened its progress. Since that time the penalty of leadership has been severe. Each new development has been the result of costly research. In fact, our Engineering Dept. has actually blazed the trail for the perfecting of magnetic chucks.

And today—the most faithful and reliable magnetic chucks of every kind are still made by Walker—Why wouldn't they be?

Our catalog will show you a magnetic chuck, which is tried and true, for every magnetic chucking need. Send for a copy.

The O. S. Walker Co.

Worcester, Mass.

CINCI PLANERS

Bear This in Mind When Selecting a Planer

The importance and the advantage of the "Tu-Speed" of Cincinnati Planers.

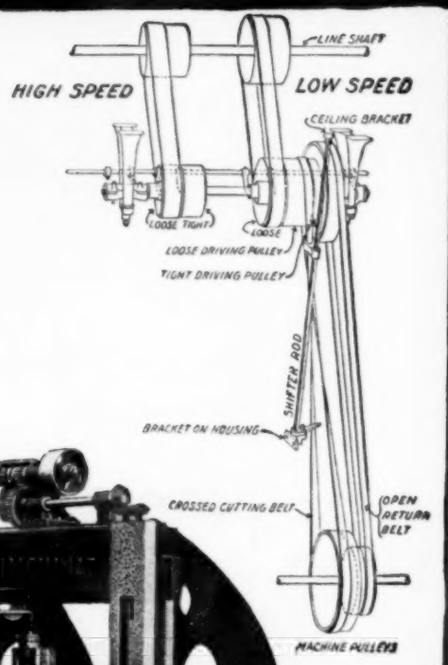
It provides two cutting speeds and a constant return to the table.

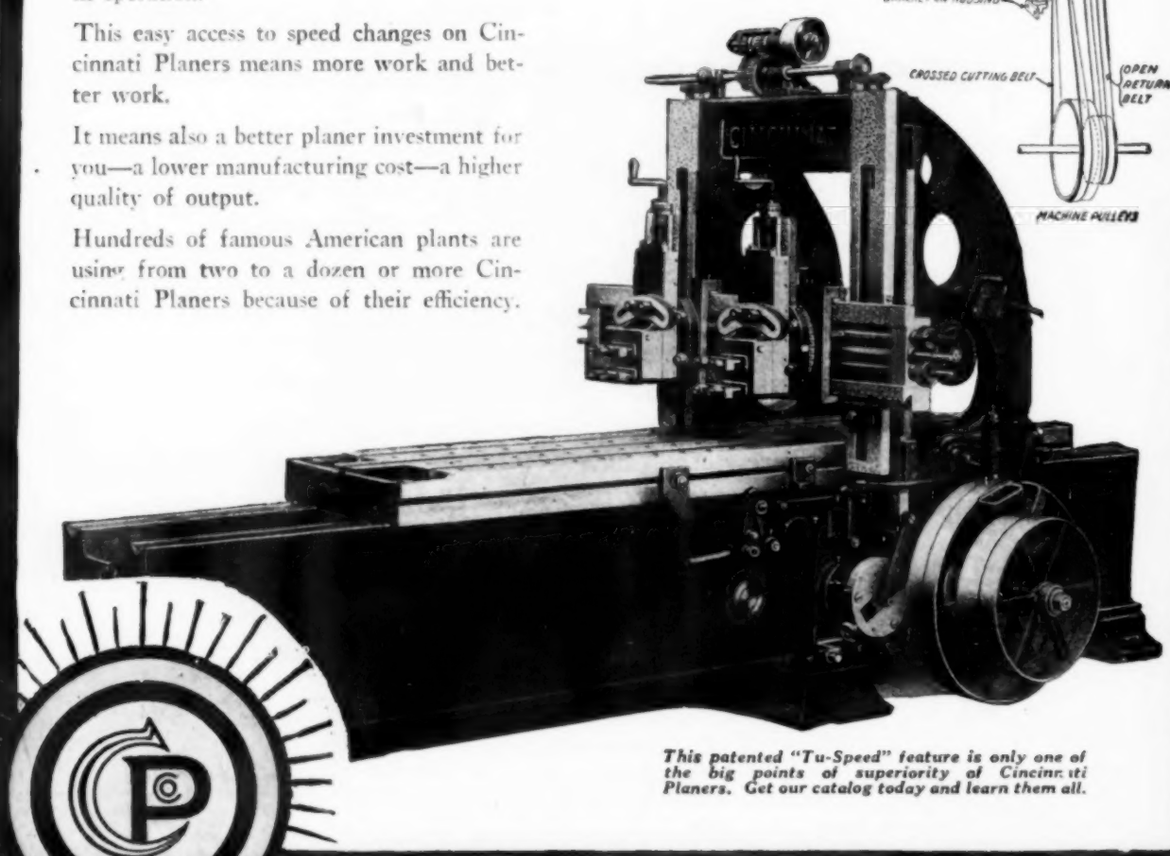
The change from one speed to the other can be made instantly while the machine is in operation.

This easy access to speed changes on Cincinnati Planers means more work and better work.

It means also a better planer investment for you—a lower manufacturing cost—a higher quality of output.

Hundreds of famous American plants are using from two to a dozen or more Cincinnati Planers because of their efficiency.





This patented "Tu-Speed" feature is only one of the big points of superiority of Cincinnati Planers. Get our catalog today and learn them all.

CINCINNATI PLANER CO.
Cincinnati, Ohio, U.S.A.

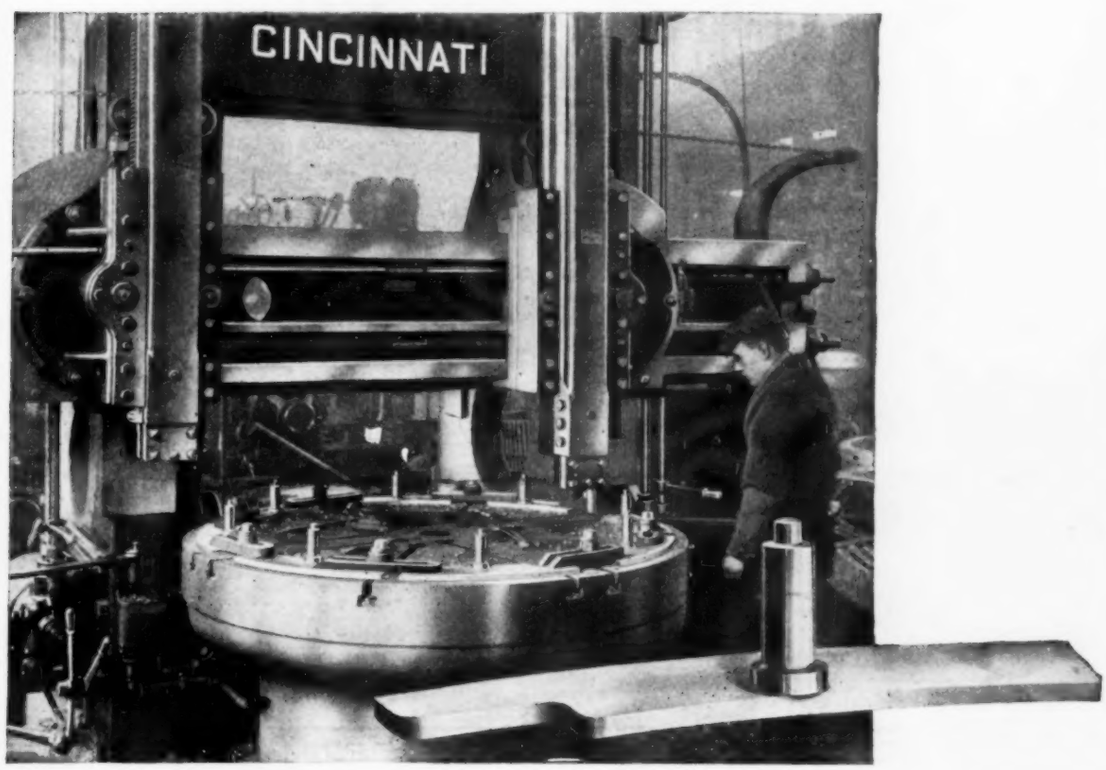
NNATI
BORING MILLS

Get High Praise in the "Workshop of the World"

For instance, the R. D. Nuttall Company of Pittsburgh is using the Cincinnati Boring Mill shown below. Eight nickel-steel lock-rod brackets are being turned at one time. "This machine has given us absolutely no trouble," says the Nuttall Company, "and is doing excellent work."

Many other Pittsburgh concerns will willingly join in the chorus.

Give us an opportunity to show you why you should handle your boring and turning jobs on a Cincinnati.



DOMESTIC AGENTS: Henry Prentiss & Co., Inc., New York, Hartford, Boston, Buffalo, Syracuse, Rochester; Motch & Merryweather Machinery Co., Cleveland, Detroit, Pittsburgh, Cincinnati; Marshall & Huschart Machinery Co., Chicago, Indianapolis; Elliott-Stephens Machinery Co., St. Louis; W. E. Shipley Machinery Co., Philadelphia; Kemp Machinery Co., Baltimore; Seeger Machine Tool Co., Atlanta; C. T. Patterson Co., New Orleans; Eccles & Smith Co., San Francisco and Los Angeles; Zimmerman, Wells & Brown Co., Portland; Hallidie Machinery Co., Seattle; Union Iron Works, Spokane, Wash.; Salt Lake City Hardware Co., Salt Lake City, Utah; Hendrie & Bolthoff Co., Denver. **CANADIAN AGENTS:** Rudel-Behan Machinery Co., Toronto and Montreal. **FOREIGN AGENTS:** Aux Forges de Vulcain, Paris; C. Churchill & Co., London. Planers: Geo. H. Alexander, Birmingham. Boring Mills: Ing. Ercole Vaghi, Milan; Miguel Mateu & Son, Barcelona, Spain; J. Lambercier & Co, Geneva; Chr. A. Herstad, Copenhagen and Stockholm; Gustav Nielsen, A/S, Christiania.

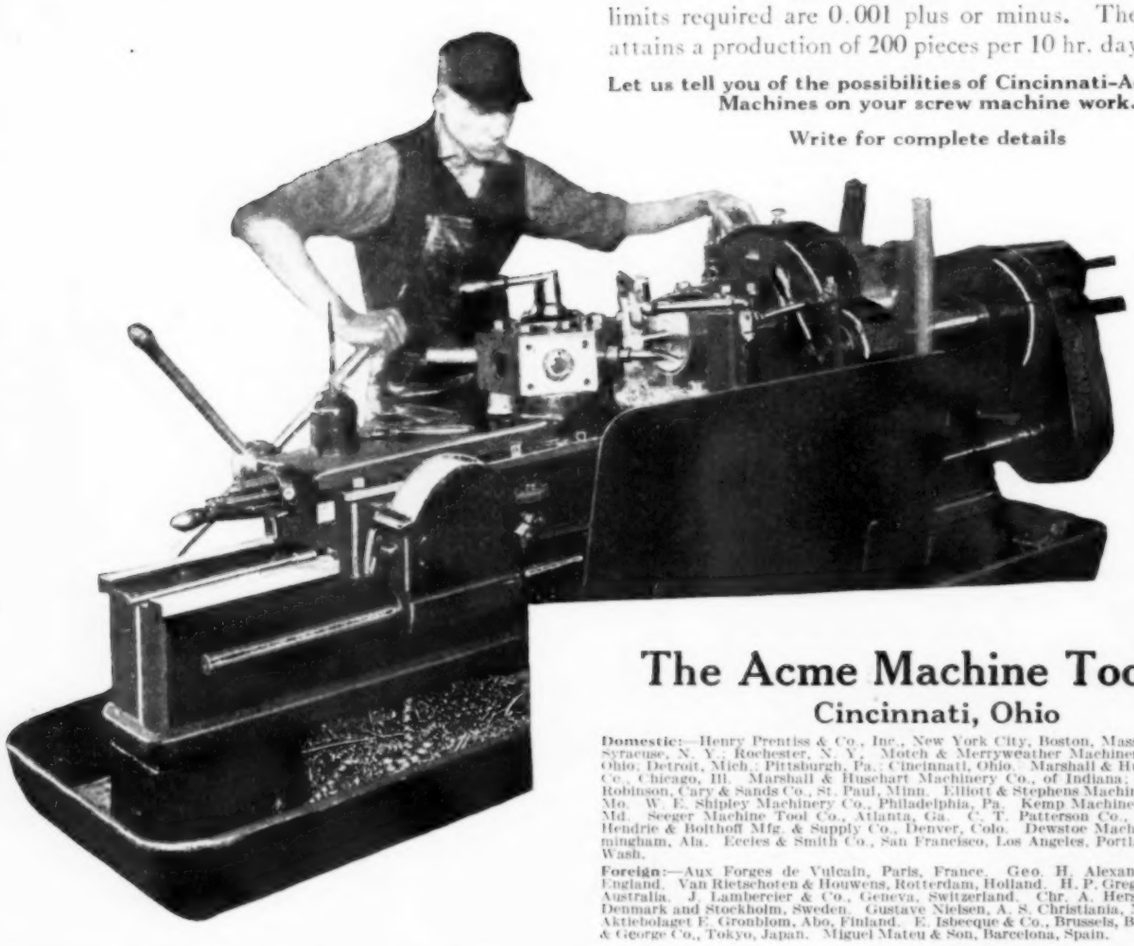
This Cincinnati-Acme Screw Machine warranted the installation of eight others

"You can't keep a good man down," nor can you keep an enthusiastic user of Cincinnati-Acme Screw Machines from repeating his order when in need of such equipment for Cincinnati Screw Machines have proven most desirable and profitable for all screw machine work. The Troy Metal Products Company ordered several additional Cincinnati-Acme Screw Machines soon after their first one was installed.

This illustration shows one of their Cincinnati-Acmes turning out Beater Shanks from cold rolled steel. Two operations are performed — drilling and reaming Rough Size of stock is $\frac{7}{8}$ in., Finished size is 0.860. Accuracy limits required are 0.001 plus or minus. The operator attains a production of 200 pieces per 10 hr. day.

Let us tell you of the possibilities of Cincinnati-Acme Screw Machines on your screw machine work.

Write for complete details



The Acme Machine Tool Co.

Cincinnati, Ohio

Domestic:—Henry Prentiss & Co., Inc., New York City, Boston, Mass.; Buffalo, N. Y.; Syracuse, N. Y.; Rochester, N. Y.; Motch & Merryweather Machinery Co., Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; Cincinnati, Ohio. Marshall & Huschart Machinery Co., Chicago, Ill. Marshall & Huschart Machinery Co., of Indiana, Indianapolis, Ind. Robinson, Cary & Sands Co., St. Paul, Minn. Elliott & Stephens Machinery Co., St. Louis, Mo. W. E. Shipley Machinery Co., Philadelphia, Pa. Kemp Machinery Co., Baltimore, Md. Seeger Machine Tool Co., Atlanta, Ga. C. T. Patterson Co., New Orleans, La. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Dewstoe Machine Tool Co., Birmingham, Ala. Eccles & Smith Co., San Francisco, Los Angeles, Portland, Ore.; Seattle, Wash.

Foreign:—Aux Forges de Vulcain, Paris, France. Geo. H. Alexander, Birmingham, England. Van Rietschoten & Houwens, Rotterdam, Holland. H. P. Gregory & Co., Sydney Australia. J. Lambercier & Co., Geneva, Switzerland. Chr. A. Hersted, Copenhagen, Denmark and Stockholm, Sweden. Gustave Nielsen, A. S. Christiania, Norway. Maskin-Aktiebolaget E. Gronblom, Abo, Finland. E. Isbecque & Co., Brussels, Belgium. Andrews & George Co., Tokyo, Japan. Miguel Mateu & Son, Barcelona, Spain.

CINCINNATI ACME

As Steady as the Stream of Time

We would call your special attention to the scientific ribbing of Greaves-Klusman Heavy Duty Lathe Beds.

As the illustration shows, it gives the maximum rigidity possible and is a decided improvement over the usual practice of having the ribs extend to only a portion of the depth of the bed.

Our entire energy and equipment is devoted to the manufacture of Engine Lathes. We have designed, experimented and tested every unit entering into the construction of our product and offer, in the assembled whole, a lathe without a peer.

The opinions of prominent manufacturers count for much and the majority insist on G-K Lathes.

Our latest Catalog details G-K Features. Every unit in their makeup has interesting points. Ask us for your copy and check up the features.

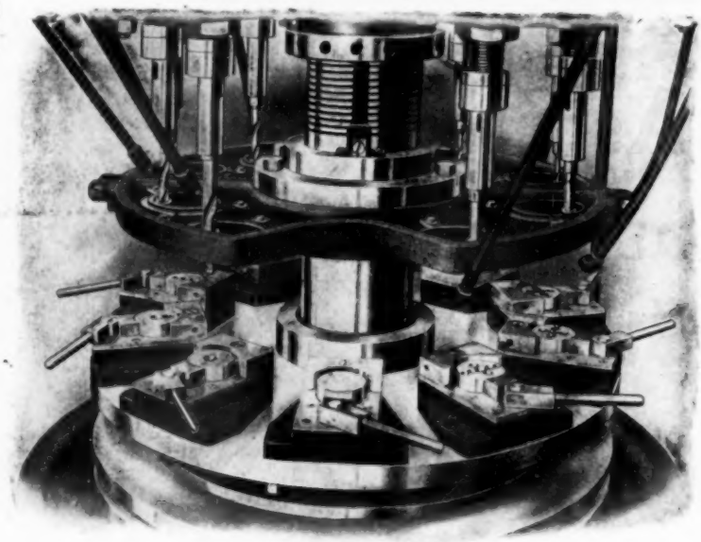
Greaves-Klusman Tool Co.
Cincinnati, Ohio, U. S. A.

DOMESTIC: The Fairbanks Co., New York City, Philadelphia, Washington, Baltimore, Albany, Boston, Buffalo, Hartford, Bridgeport, Newark, Paterson, Trenton, New Orleans, Scranton, Syracuse, Rochester, Providence. Federal Machinery Sales Co., Chicago, Ill., and Milwaukee, Wis. J. R. Stone Tool & Supply Co., Detroit, Mich. William K. Stamets, Pittsburgh, Pa., and Cleveland, Ohio. Eccles & Smith Co., Portland, Ore. Elliott & Stephens Machinery Co., St. Louis, Mo.
FOREIGN AGENTS: George H. Alexander Machinery, Ltd., Birmingham, England. Yamatake Co., Tokyo, Japan. Chr. A. Herstad, Copenhagen, Denmark, and Stockholm, Sweden. Gustav Nielsen, A./S. Christiania, Norway.

HOLES

Drilled At Any Angle With Greater Speed and Economy

The Cincinnati-Gridley Automatic Multiple Spindle Drill was designed for rapidly drilling parts which are difficult to handle in any other way. It saves labor, time and floor space. It is in reality a vertical screw machine, having a decided feature of "progressive operations." It drills, reams, counterbores, and faces. Holes can be drilled cutting into each other, or as far apart as the capacity of the machine permits, which varies accordingly with the number of spindles.



Cincinnati-Gridley Automatic Multiple Spindle Drills

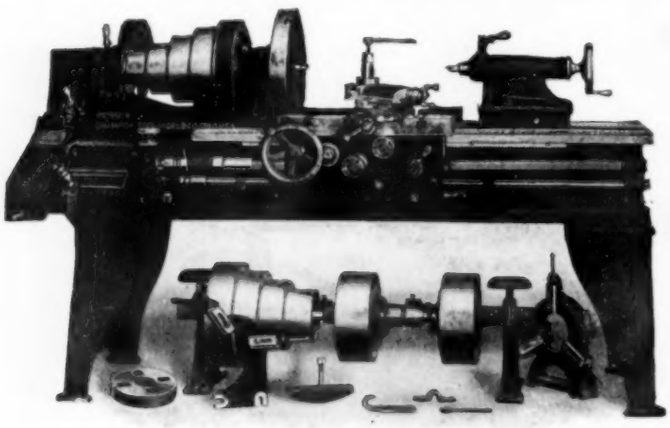
will enable you to drill holes at a much lower cost, we believe, than you have ever been able to do before.

As many spindles may be built into the machine as may be required. Each spindle can be geared to the right speed for the tool which it carries. Only one position for loading. Every index means a finished part.

Submit your drilling problems to us. Our engineering Service Department will solve them for you.

Cincinnati Automatic Machine Co., Cincinnati, Ohio, U. S. A.

Manufacturers of **Multiple Spindle Automatic Screw Machines and Multiple Spindle Automatic Drills**



CHAMPION Chats

Steps are Dollars

in a machine shop just as they are on the turf. And a lathe in your plant that cuts down the operator's steps by 25 per cent puts a definite number of dollars in your pocket.

From apron to back gear, the "CHAMPION" is an ultra-modern machine—not an "old-timer" made over here and there. Its quick change Gear Box, Chasing Dial on carriage and many other time savers, bring out speed and accuracy that isn't surpassed anywhere.

"Champion" Lathes save something else besides steps—that's repair bills. It's the way they are built.
Write for literature that tells how.

Champion Tool Works
Spring Grove Avenue, Cincinnati, Ohio

THE principle of design whereby the grinding wheel is made to follow a master plate, places Bryant Grinders far ahead of others in grinding a combination of taper and curved formed holes.

The use of a special control or master plate for each combination results in a tremendous saving of time usually required to set up for the different operations, and insures absolute duplication of work.

THE BRYANT CHUCKING GRINDER COMPANY
Springfield, Vt

HOLE GRINDERS DEEP HOLE GRINDERS HOLE AND FACE GRINDERS

Milwaukee Milling Machines

The Rigid Double Overarm

The double overarm consists of two steel bars accurately parallel with the spindle. It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line, and positive alignment is maintained at all times. The arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work. This construction also affords such a degree of rigidity that milling may often be done without the use of the arm braces.

It is also practical to use large diameter cutters at a distance from the face of the column, thereby permitting the finishing of work on Milwaukee Milling Machines that would otherwise have to be taken to the planer.

The triangular arbor supports act as trusses of great strength, lacing the two arms together and providing a greater degree of strength and rigidity.

This is but one of the numerous "Milwaukee" features. Our catalog gives them all. Write for a copy today.

This battery of Milwaukee Milling Machines is the pride of the plant.

KEARNEY & TRECKER CO. **Milwaukee, Wis., U. S. A.**

New York: 1801 Singer Bldg. Cleveland: 738 Superior Ave., N. W. Chicago: 631 Washington Blvd.

ANY combination of a radial and a thrust load can be taken care of on a suitably designed single-row Gurney Ball Bearing.

The idea involved is that of inclining the load line of the balls to coincide with the resultant of the various loads on the bearing.

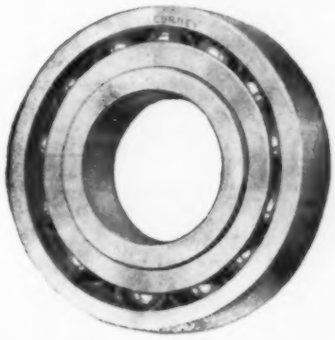
Carrying all loads on a single row of balls is a remarkably effective method of simplifying machine design and eliminating unnecessary weight.

Each Gurney Radio Thrust Bearing is carefully designed for the particular combination of forces under which it is to operate. The design is arrived at only after a very thorough mathematical consideration of the problem by the Engineering Department.

GURNEY BALL BEARING COMPANY

Conrad Patent Licensee

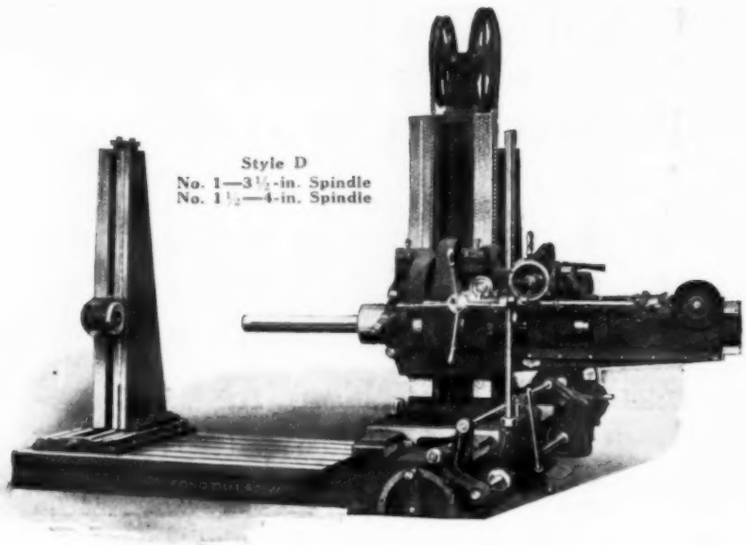
Jamestown New York



GURNEY

BALL BEARINGS

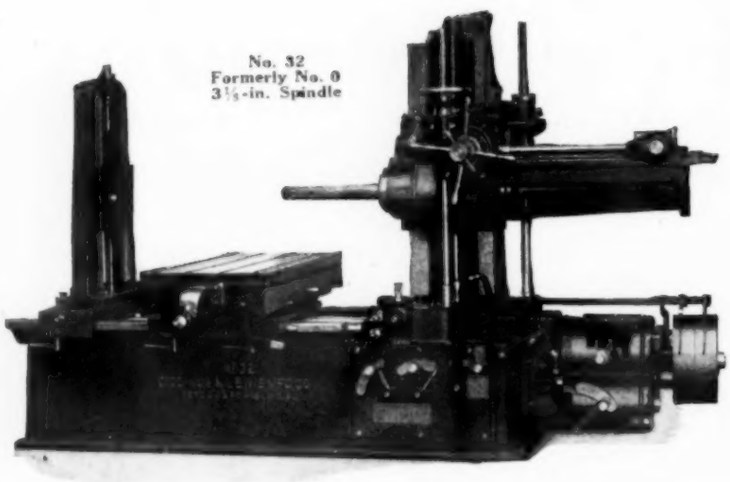
Do You Believe in Luck?



Style D
No. 1—3½-in. Spindle
No. 1½—4-in. Spindle

G & L stands for good luck in the selection of horizontal boring mill equipment, for G & L Horizontal Boring Mills inevitably effect increased production and a reduction of machining costs.

G & L Horizontal Boring Mills will handle the regular line of horizontal boring mill work as well as those jobs whose size and shape does not enable them to be machined economically on other equipment. They will perform all the operations necessary to complete a casting in one setting. This method is a short cut to machining accomplishments which has resulted in "dollars saved" for many manufacturers. Why not you?



No. 32
Formerly No. 0
3½-in. Spindle

We are anxious for you to learn of the many unusual features of G & L Horizontal Boring Mills that are described in our catalog. May we send it?

Giddings & Lewis Machine Tool Co.

Fond Du Lac. Wisconsin

DOMESTIC AGENTS: Henry Prentiss & Co., New York City, Syracuse, Rochester, Buffalo, Boston; Marshall & Huschart Machinery Co., Chicago, Milwaukee; Swind Machinery Co., Philadelphia, Baltimore; Motch & Merryweather Machinery Company, Cleveland, Pittsburgh, Detroit; E. A. Kinsey Company, Cincinnati, Indianapolis; Smith Courtney Company, Richmond, Va.; Young & Vann Supply Co., Birmingham, Ala.; Blackman-Hill-McKee Machinery Co., St. Louis; Eccles & Smith Co., San Francisco, Los Angeles, Portland; English Tool & Supply Co., Kansas City; Fairbanks Co., New Orleans; McMullen Machinery Co., Grand Rapids, Mich.; Manning, Maxwell & Moore, Inc., Seattle; Northern Machinery Co., Minneapolis; Salt Lake Hardware Co., Salt Lake City; Sunderland Machinery & Supply Co., Omaha.

FOREIGN AGENTS: Canadian Fairbanks-Morse Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver, Hamilton; Fenwick Freres & Co., Paris, Lyons, Liege, Brussels, Zurich; Burton Griffiths & Co., England; R. L. Scrutton & Co., Ltd., Sydney, Australia; Gustav Nielson, Christiania; A. B. Galco, Ltd., Stockholm, Sweden; Sale & Frazar, Ltd., Tokyo, Japan; American Machinery Syndicate, Spain, Portugal; Maskinbolaget Groenblom, Abo, Finland; Gaston, Williams & Wigmore, Shanghai, Hongkong, Hankow, Tientsin, China.

LINCOLN

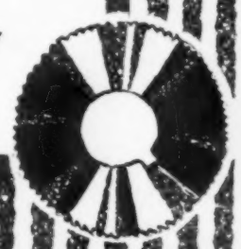
High Speed Screw Slotting Cutter Service

The selection of the proper screw slotting cutter for a particular grade of steel can usually best be made by experiment.

We stand ready at all times to co-operate with users of screw slotting cutters in making the proper selection. Our experience with high speed steels should be worth something to you in this connection.

Communicate with us about this

Lincoln Twist Drill Company
Taunton, Mass., U. S. A.



CARD

Figure it out on a "cost per hole" basis—and invest in Card Taps

Foreign Agencies

CHARLES CHURCHILL & CO.
London, Birmingham, Manchester, Glasgow, and Newcastle-on-Tyne.
V. LOWENER
Verterbrogade 9 B, Copenhagen, Denmark.

MARKT & CO.
Paris.
V. LOWENER'S MASKINFORRETNING
Sverre Mohn, Christiania, Norway.
C. CIVITA
Milano, Italy.

Threading Tools

Here is the Card plant—up to the minute in design and organization. Within these walls the Card trade mark is maintained at a constant value which has not varied for a generation. Every act of every member of every department in the Card organization is aimed at sustaining Card prestige. Card Quality Products reflect this fact.

In diversity of products, too, the Card line is unusual. The catalog tells the story.

The CARD Quality

S.W.CARD MFG. CO.

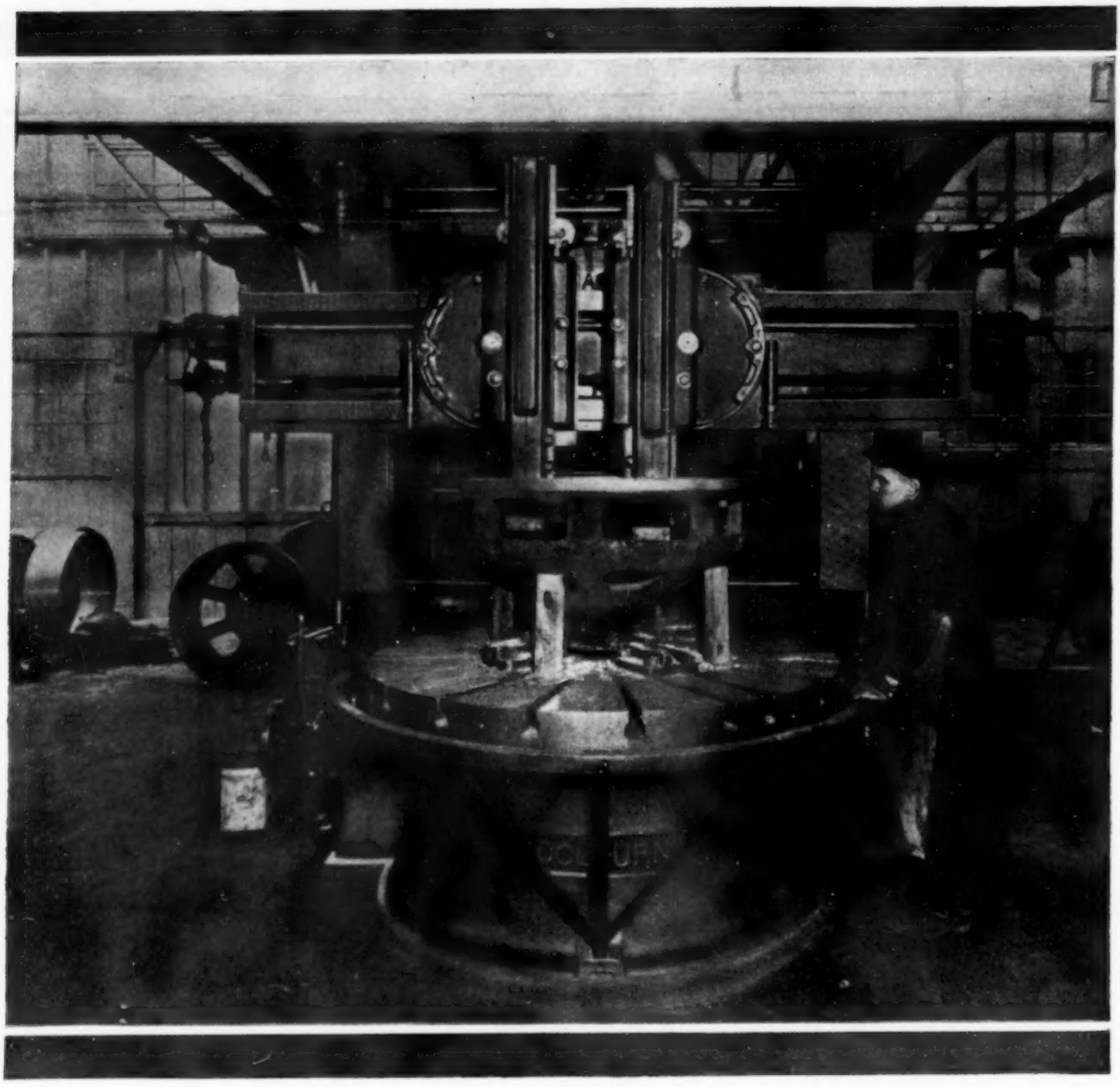
DIVISION OF UNION TWIST DRILL CO.

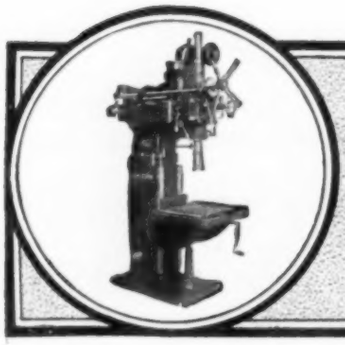
MANSFIELD, MASSACHUSETTS, U.S.A.

R. S. STOKVIS & ZONEN, LTD.
Rotterdam.
J. LAMBERCIER & CO.
Geneva.
V. LOWENER
Drottinggatten 90, Stockholm, Sweden.

R. D'AULIGNAC
Barcelona, Spain.
ATELIERS DEMOOR
Brussels, Belgium.
A. M. PAPASIDERIS & CO.
Athens, Greece
ANDERSON, MEYER & CO., LTD.

Shanghai, Changsha, Hankow, Harbin, Hongkong, Kalgan, Pekin, Tientsin, Vladivostok, China.
MESTRE & BLATGE
Rio de Janeiro, Brazil, Buenos Aires, Argentine Republic.





COLBURN

Semi-Steel Generator Heads Turned, Bored and Faced On This 72-Inch "Colburn"

Three operations on this job—and the 72 inch Colburn Boring and Turning Mill gets Ford & Son's full O.K. in spite of the fact that the generator head does not take up the full capacity of the mill. The dependable accuracy and the ability of the Colburn to "carry on" under widely varying requirements are big factors in the Ford & Son O.K. This particular work is being done in their plant at Dearborn, Mich.

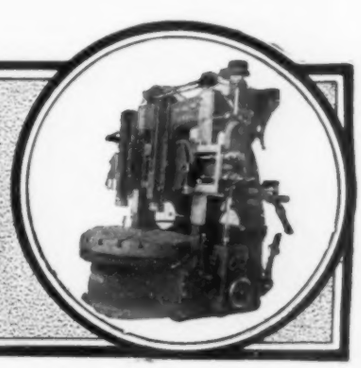
Colburn design involves something more than backbone. For no matter at what point or in which direction the stress may come, there's not a sign of chatter in the tools because of the rigid construction of the rams and heads.

WHY NOT GET COLBURN BULLETINS?

Simply write us.

DOMESTIC AGENTS: Henry Prentiss & Co., Inc., New York, Boston, Hartford, Conn., Buffalo, Rochester, Syracuse, N. Y., Scranton, Pa.; Strong, Carlisle & Hammond, Cleveland and Detroit; Brown & Zortman Mach. Co., Pittsburgh; Sherritt & Stoer Co., Philadelphia; Dale Brewster Co., Chicago; Northern Machinery Co., Minneapolis; Seifreat Woodruff Co., Cincinnati and Dayton, Ohio; Berger & Carter, San Francisco and Los Angeles, Cal.; Hallidie Machinery Co., Seattle, Wash.; Young & Vann Supply Co., Birmingham, Ala.; C. T. Patterson Mach. Co., New Orleans, La.; Ralph B. Bowman, St. Louis, Mo.; Mills & Lupton, Chattanooga, Tenn.; Fulton Supply Co., Atlanta, Ga.; Marshall & Huschart Machinery Co., (Drill Presses only), Indianapolis, Ind. CANADIAN AGENTS: H. W. Petrie, Toronto, Ont.; Rudel Belnap, Montreal, Que.

FOREIGN AGENTS: Fenwick Freres, France, Switzerland, Italy; E. Isbecque & Co., Belgium; American Machinery Syndicate, Spain and Portugal; Charles Churchill & Co., (Boring Mills only), England; Alfred Herbert, Ltd., (Drill Presses only), England, Australia, Japan, India.



MACHINE TOOL COMPANY

FRANKLIN PA. U.S.A.

Builders Also of Colburn Heavy Duty Drill Presses

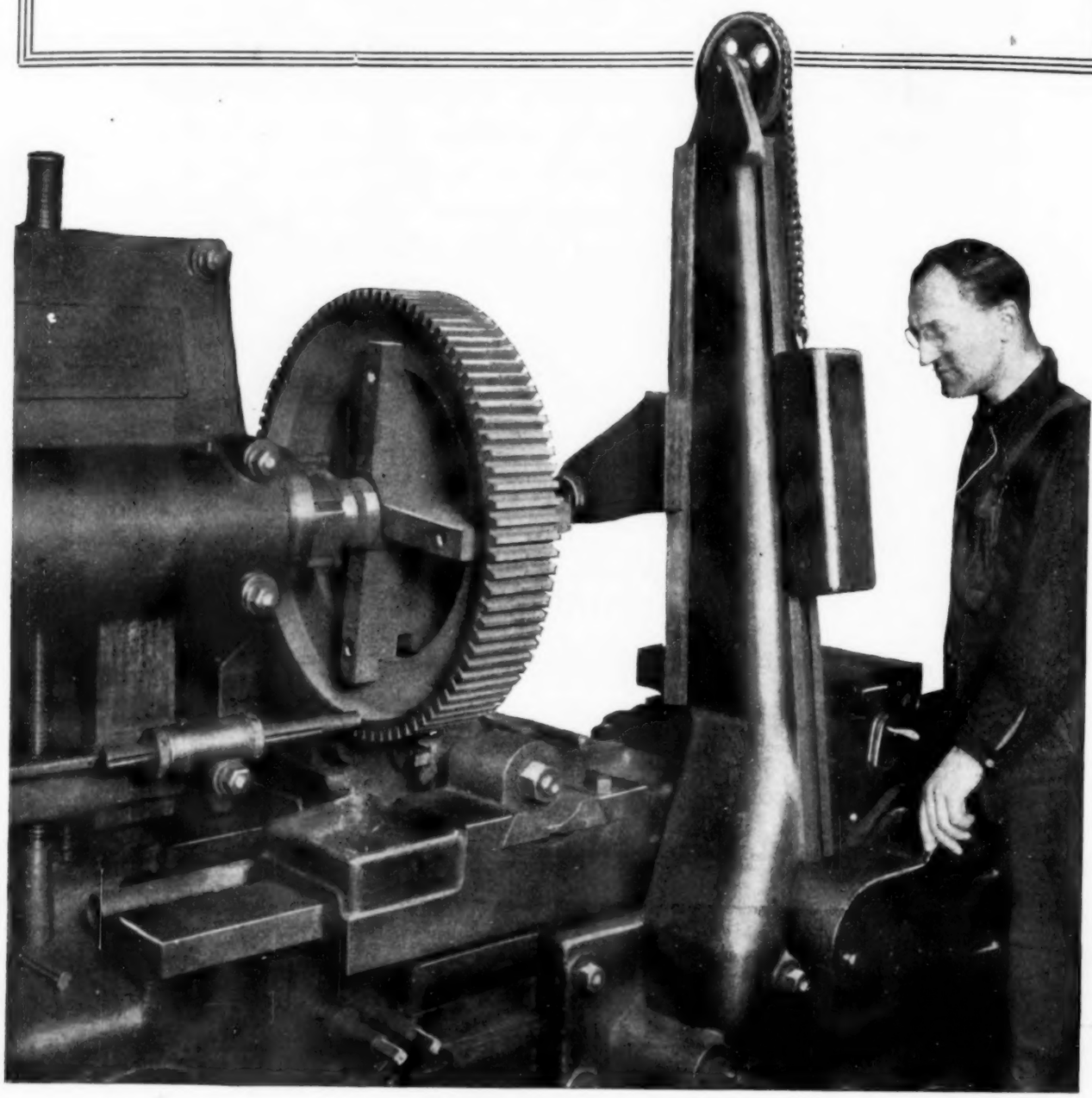
Cutting Gears the Cincinnati Way Always Gives Better Results

Cincinnati Gear Cutting Machines turn out highly accurate work in large quantities. Wherever they are used they win for the manufacturer a reputation for quality work, and at the same time reduce his production costs to a minimum.

The Cincinnati No. 5 Gear Cutter shown here was photographed in the plant of the E. B. Holmes Machine Company. The specifications call for close accuracy, and the Cincinnati is giving it to them.

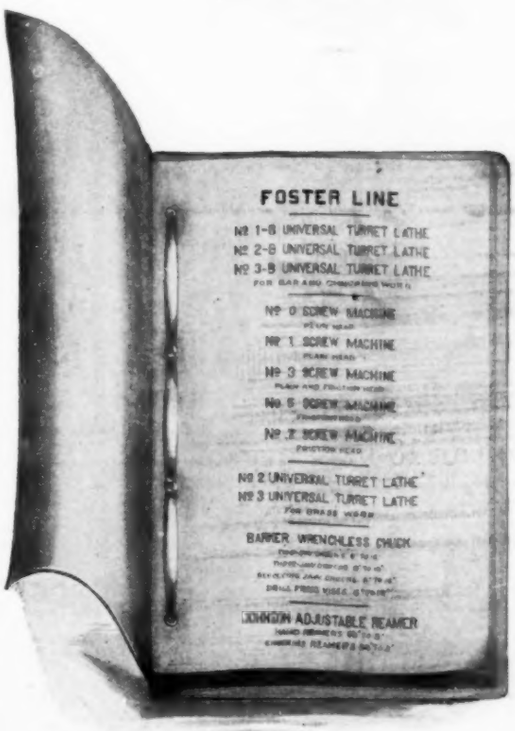
Write us for helpful suggestions about the best way to handle your gear work

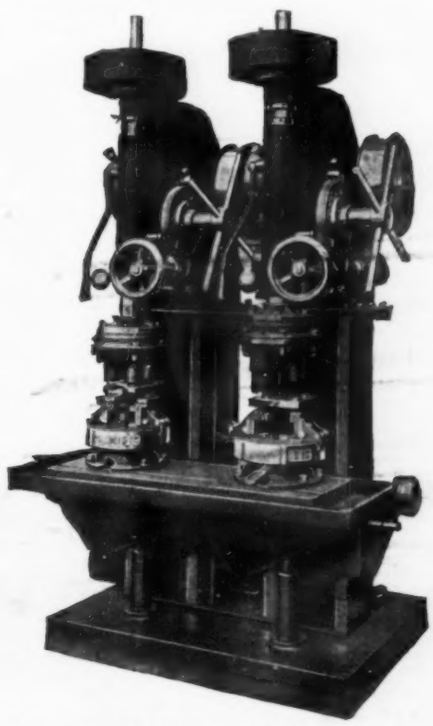
The Cincinnati Gear Cutting Machine Co.
Cincinnati, Ohio, U. S. A.
Subsidiary of The Cincinnati Shaper Co.



Barker Wrenchless Chucks and Drill Vises With Steel Bodies Qualify

For rapid production on lathe, drill or milling machine, there is none more productive than the BARKER. Every movement and every moment a productive one. You can increase your production and eventually will. Why not start the investigation now? A Barker Chuck or Vise will start you right.


FOSTER LINE
№ 1-B UNIVERSAL TURRET LATHE
№ 2-B UNIVERSAL TURRET LATHE
№ 3-B UNIVERSAL TURRET LATHE
№ 0 SCREW MACHINE
№ 1 SCREW MACHINE
№ 3 SCREW MACHINE
№ 2 UNIVERSAL TURRET LATHE
№ 3 UNIVERSAL TURRET LATHE
BARKER WRENCHLESS CHUCK
JOHNSON ADJUSTABLE REAMER



A two-jaw Barker jigged for action on a Baker Bros. two-spindle drill.

A movement on the lever and work is instantly held with unshakable grip; again, and all is released. Jaws are adjusted to any size. Can you recall a set-up more complete?

Send today for catalog

FOSTER MACHINE COMPANY, Elkhart, Ind.

Vernon A. Wear
Special Representative
Herberts Machinery & Supply Co.
Los Angeles and San Francisco, Calif.

E. R. Wilson — Special Representative of The Chas. A. Strelinger Co., 43-51 Larned St., E., Detroit, Mich.

CHUCK DEPARTMENT

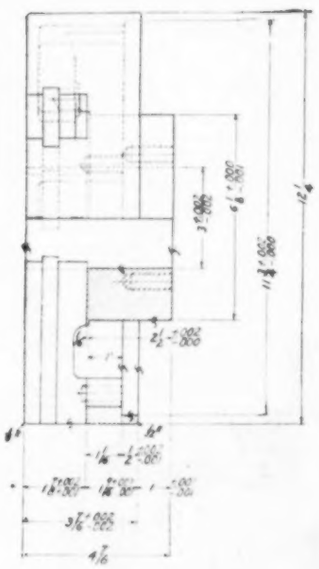
REPRESENTATIVES:

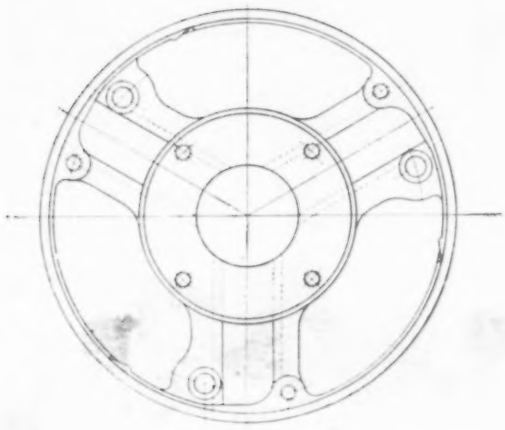
David T. Siegel, 5th Floor, Grand Central Palace New York, N. Y.

J. H. Hoetger
Ohio Sales Engineer W. Pa.
2142 Euclid Ave., Cleveland, Ohio
Chucks carried in stock by W. M. Pattison Supply Co., Cleveland

R. A. Braunberger Tool & Machinery Co., 1215 Majestic Building, Milwaukee, Wis. 549 Washington Blvd., Chicago, Ill.

FOSTER PRODUCTION FIGURES





The Cost of Machining This Steel Chuck Body Was Cut 70 Per Cent.

The Foster Universal Turret Lathe Did It.

Here are the facts and figures:

The chuck body used to be machined on an 18-in. heavy duty engine lathe.

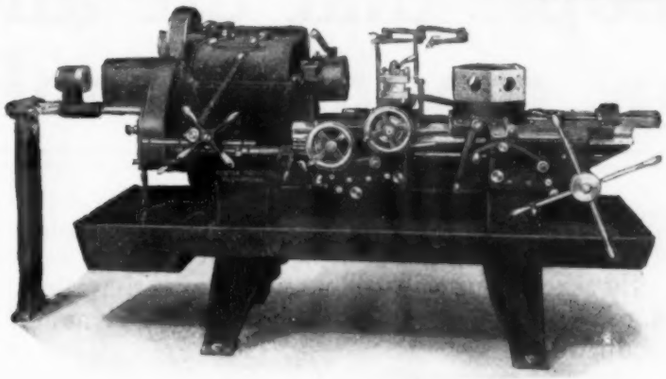
Production time 4 hours and 10 minutes. Piece work price $4.00

It is now being machined on a Foster 3-B Universal Turret Lathe in 1 hour and 12 minutes. Piece work price $1.20.

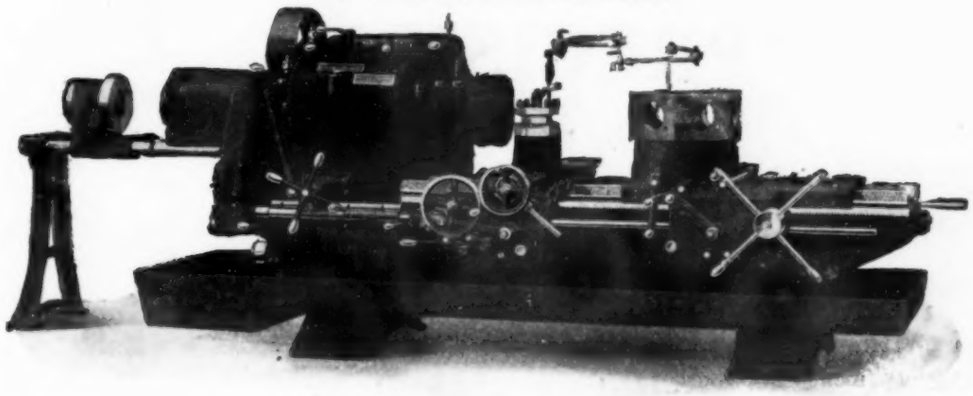
Saving per piece $2.80.

FOSTER MACHINE COMPANY,

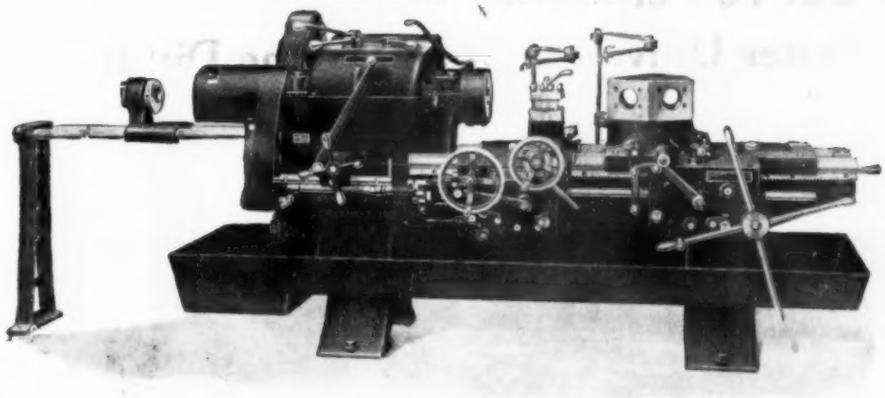
THE FOSTER UNIVERSAL TURRET LATHE



1-B Universal Turret Lathe



2-B Universal Turret Lathe



3-B Universal Turret Lathe

Wages are still going up. Are you allowing your production costs to mount upwards with the wages, or are you taking steps to get better equipment?

The figures quoted on opposite page are of interest to you. READ THEM.

Then send us your blue prints and let us show you what our machine can do on your work.

ELKHART, INDIANA, U. S. A.

"—people that use and know machine tools"

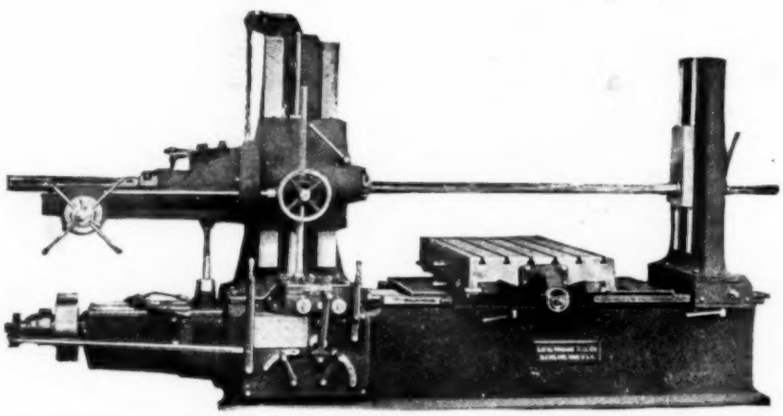
An *American Machinist* Field Photo Service man, who has "shot" machine tools in hundreds of shops, recently asked a superintendent why it was that the predominating boring machine in every tool and die shop was the

LUCAS "PRECISION" Boring, Drilling and Milling Machine

The "super" said:

"All our work comes from the largest manufacturers—*people that use and know machine tools.* When we solicit work, one of the first questions asked us is: 'What equipment have you got?'

"The boring answer that always brings the work is LUCAS."



Lucas Machine Tool Company

Cleveland NOW AND ALWAYS OF Ohio, U. S. A.

Alfred Herbert, Ltd., Coventry; Societe Anonyme Belge Alfred Herbert Brussels; Allied Machinery Co., Turin, Barcelona, Zurich; Benson Bros., Sydney, Melbourne; V. Lowener, Copenhagen, Christiania, Stockholm; R. S. Stokvis & Zonen, Rotterdam; Andrews & George Co., Tokyo.

No Lathe can do quite as much

To handle every job ordinarily handled by lathes ranging from 24-in. swing to 40-in. swing is the boast of the *"All-in-1"*

And it performs any one of these jobs assigned to it as easily as does a standard tool designed for a one-size job.

Talk about the *"All-in-1"* and you're talking about a whole shopful of lathes.

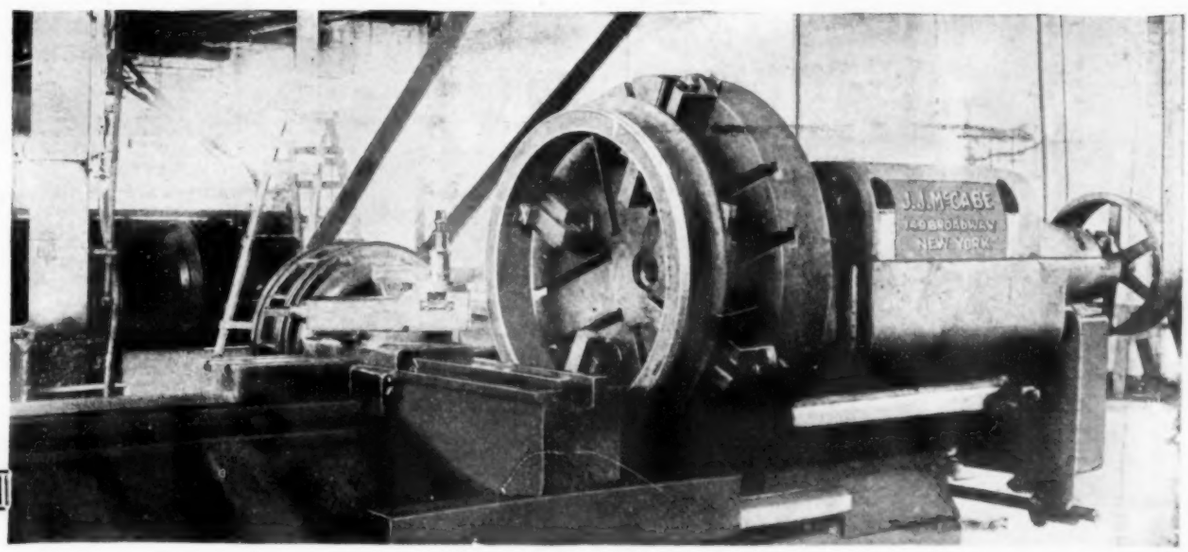
Do you know, too, that the *"All-in-1"* saves you from 1 to 2 thousand on the cost of a 40-in. geared-head lathe?

Have you your copy of Bulletin A?

Send for it today.

J. J. McCabe Lathe & Machinery Corp.
149 Broadway, New York City

"All-in-1"



Minstrelsy

OHIO

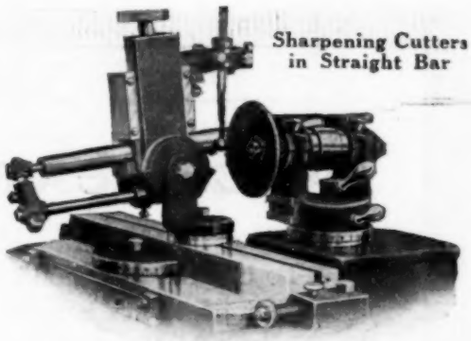
You well remember the merry minstrel men of yesterday. Every member an adept at bones or banjo, tambo or tuba, jigs or jokes. Call on any one to fill any role and "he was there."

Ohio Grinding Machines are likewise "there" when it comes to versatility. Their ease of operation assures speed on an endless variety of grinding jobs. Accuracy—as in all other Ohio machine tools—is understood.

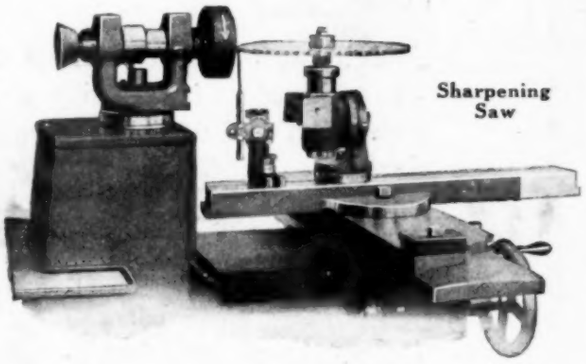
High-grade materials and careful construction make them both reliable and long-lived.

Look into Ohio merits, if you desire to materially reduce your toolroom and manufacturing costs.

Ohio literature is comprehensive and will be of value in your equipment files.



Sharpening Cutters in Straight Bar



Sharpening Saw

The Oesterlein Machine Company

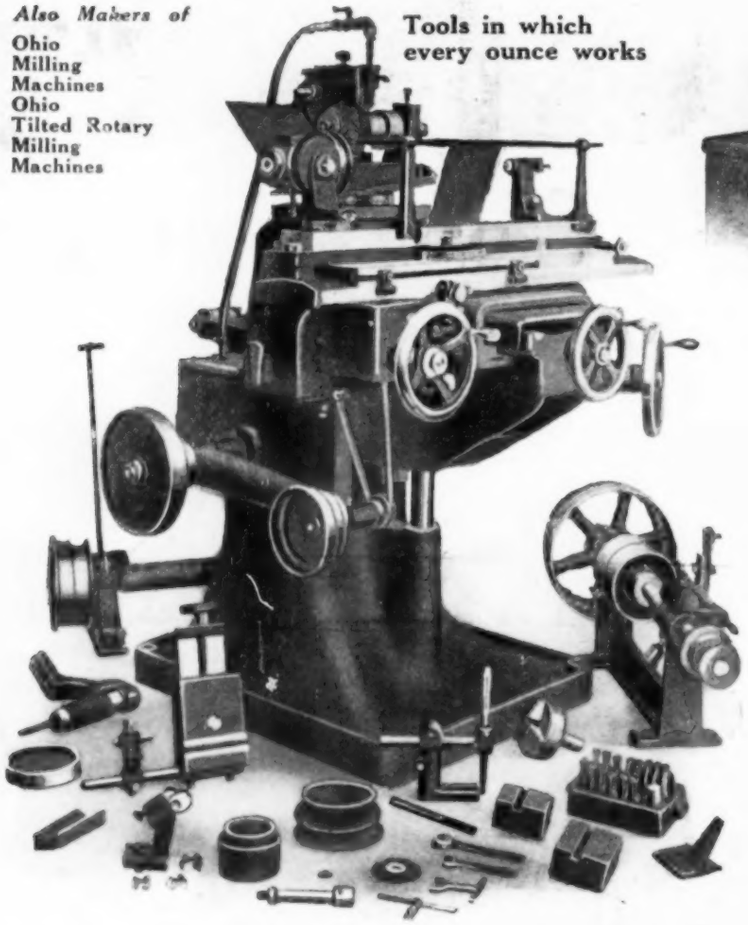
Cincinnati, Ohio

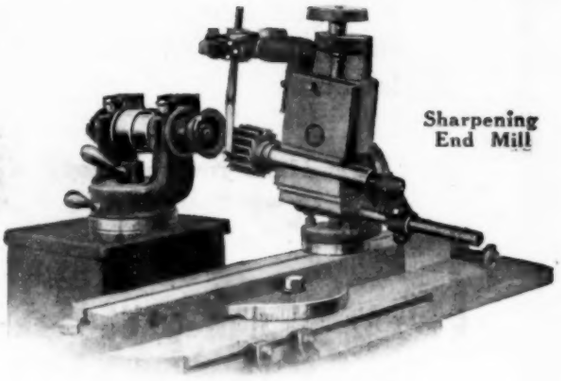
Also Makers of

Ohio Milling Machines

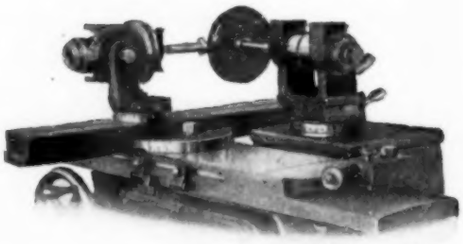
Ohio Tilted Rotary Milling Machines

Tools in which every ounce works

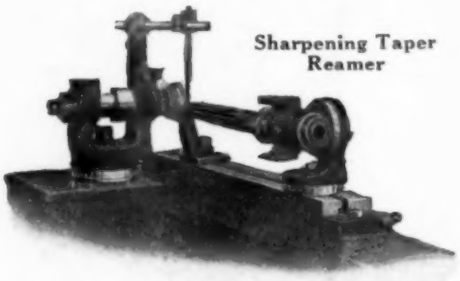




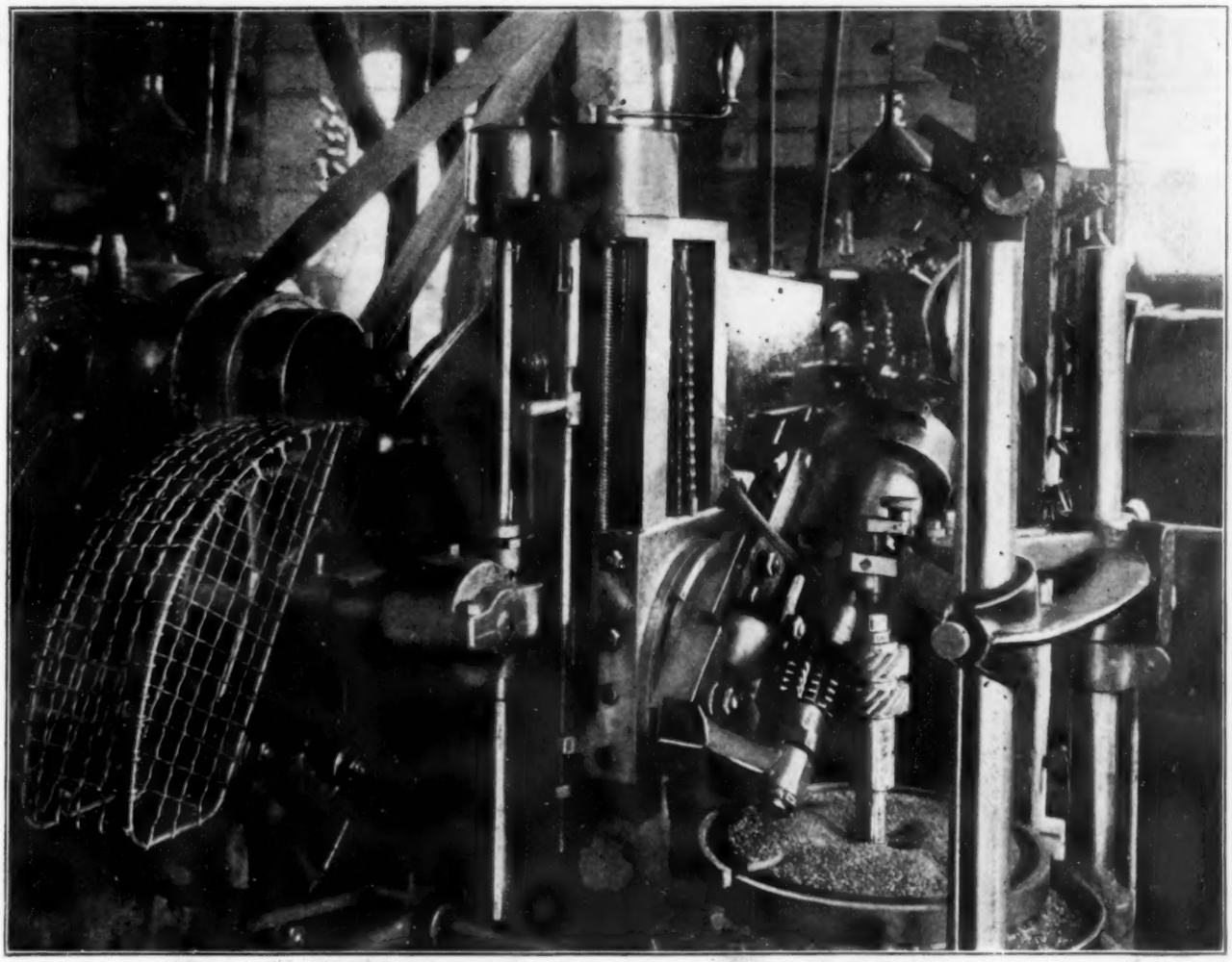
Sharpening End Mill



Grinding Face of Shoulders



Sharpening Taper Reamer



The Farwell Gear Hobber

"We find the No. 4 Farwell Gear Hobber very suitable either for large quantities of gears or for changing from one size to another."—Woburn Gear Works.

THE illustration, presented through the courtesy of the Woburn Gear Works, Woburn, Mass., shows a No. 4 Farwell Gear Hobber cutting spiral gears of 2¾ inches in diameter, at the average rate of 7 per hour.

The value which this user places in the Farwell is shown by its ability to make quick changes from one style of gear to another.

On the Farwell there is no great difference between worm wheel and spiral gear cutting, and spur gear cutting. The great range of feeds between the hob spindle and the work arbor makes it possible to time the hob spindle with the table in such a way that the teeth may be easily and accurately cut at practically any angle whatsoever.

To facilitate the setting of the hob spindle at the proper angle for cutting spiral gears, the saddles of the No. 2 and No. 4 Farwell Gear Hobbers are graduated in degrees, and a vernier graduation on the head enables accurate setting to minutes. The head may be swiveled and firmly set at any position in the entire circle.

From this it is evident that changing from spur to spiral setting is but a simple matter.

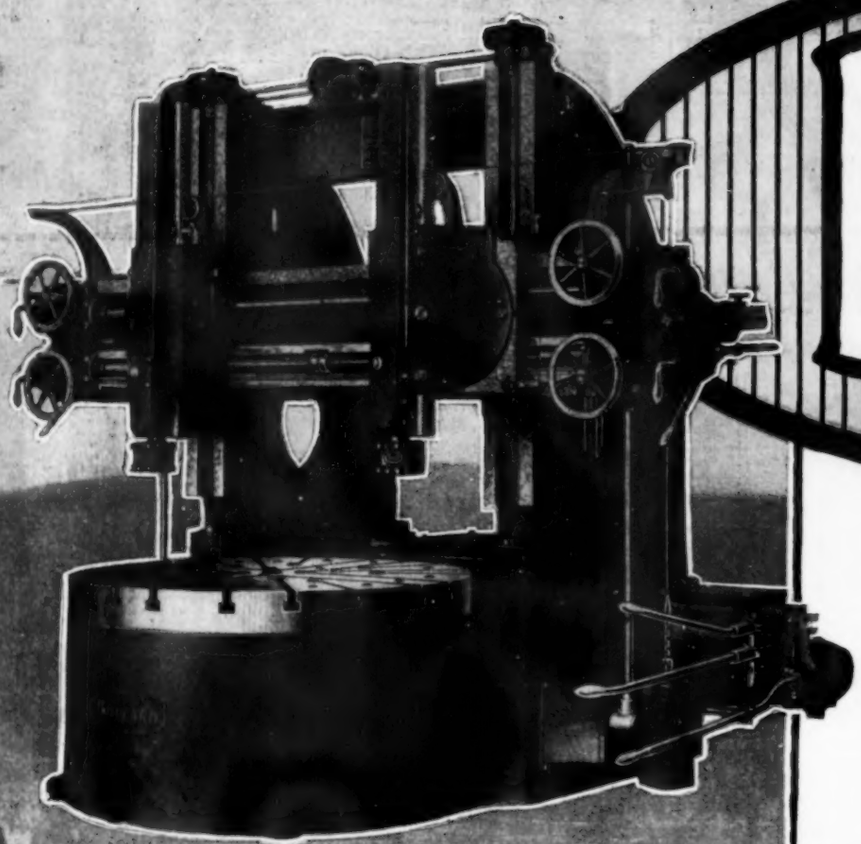
Literature on request.

THE ADAMS COMPANY, 1904 Bridge Street Dubuque, Iowa, U. S. A.

Established 1883

The Power Back of

BUL



Never was the need for consistently reliable transportation service greater than at present. This service can be maintained only by motive power that is backed up by railroad shops equipped with machine tools that can meet the unusual demand for versatility and ability to produce under any and all conditions.

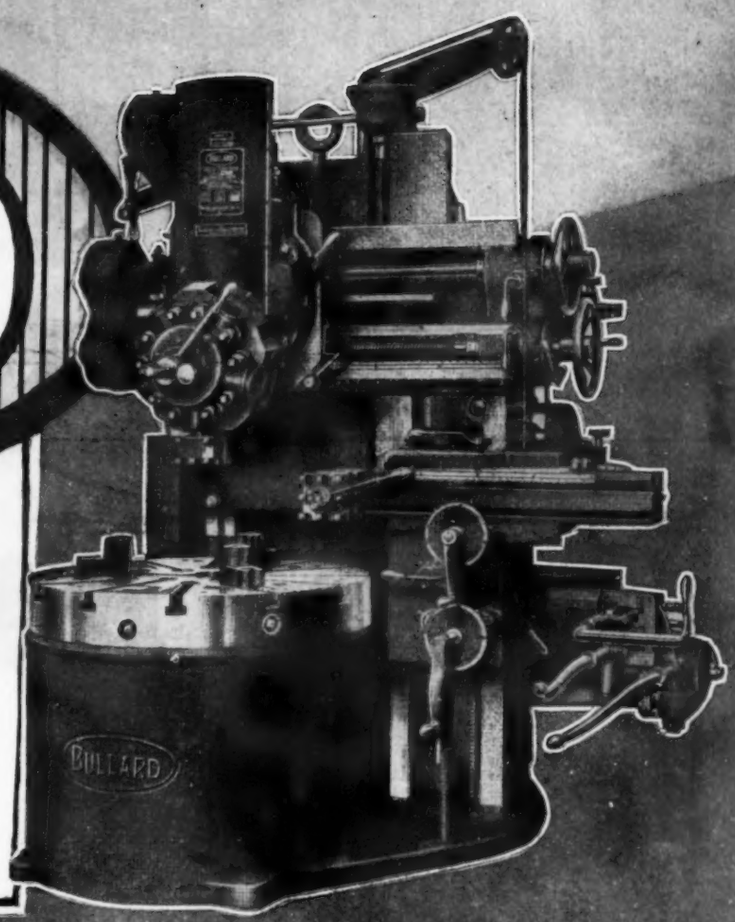
Vertical construction, automatic lubrication, chrome nickel steel gears, power traverse, hammer hand wheels, and micrometer dials are a few of the features which, in combination, have made the name Bullard synonymous with all that is good in machine tool practice.

The Bullard Mac

Bridgeport

our Transportation

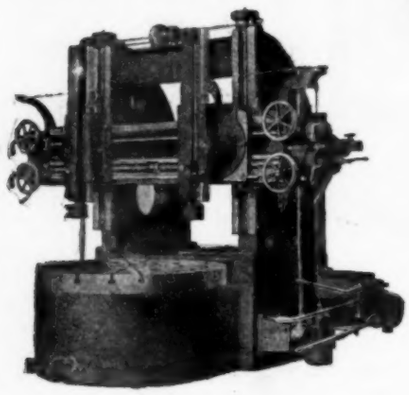
LLARD



Railroad shops throughout the country have installed hundreds of Bullard Vertical Turret Lathes and Maxi-Mills for the machining of locomotive parts—piston packing rings, pistons, cylinder heads, rod brasses, driver boxes, etc. The size of these installations and the fact that they are present in every railroad shop of importance is sufficient proof of the power of Bullards to maintain transportation schedules at a low cost per ton mile. The following pages show a number of unretouched photographs taken in representative shops.

ne Tool Company
Connecticut

OUT OF THE



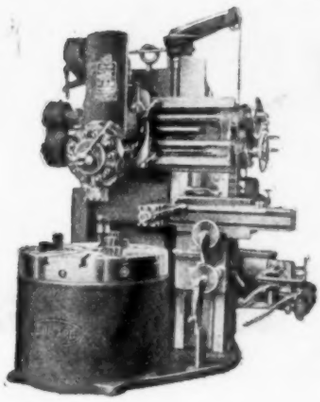
The illustrations shown on this and the page opposite were selected from hundreds of photographs taken on the job, and which, with machining data, form a part of our vast compilation of Bullard record performances.

The Bullard Machine Tool Co.
Bridgeport, Conn., U. S. A.

BULLARD

BULLARD

MULTITUDE

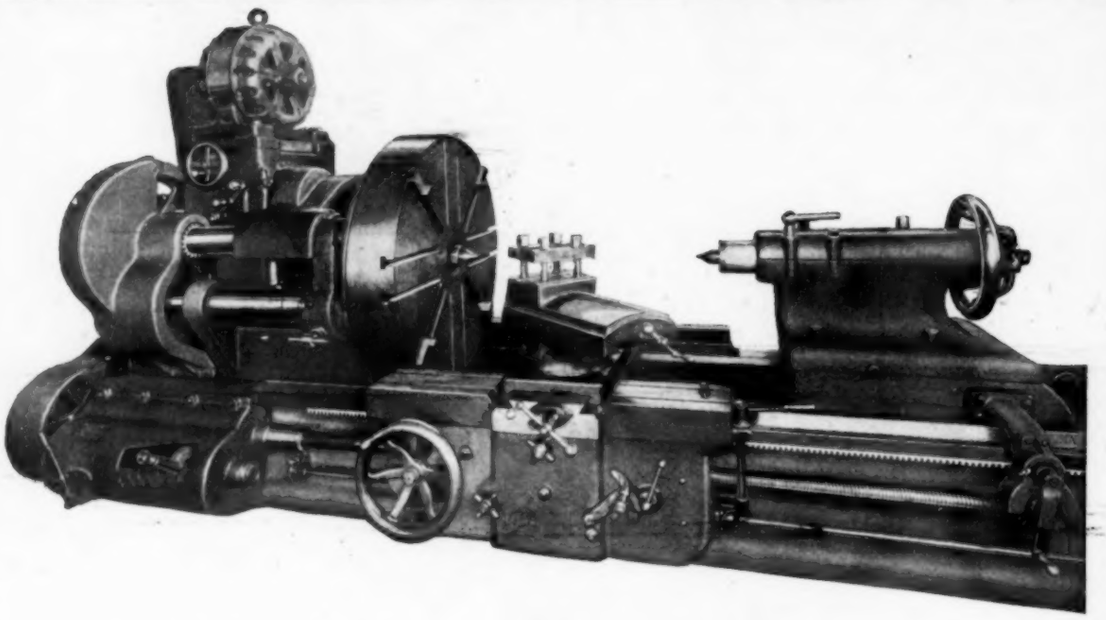


Our Engineering Service Department is prepared to send you recommendations and tooling layouts. You have but to send prints or a rough and a finished sample of the part to be machined, together with such information as will enable us to proceed intelligently. This service is without obligation.

The Bullard Machine Tool Co.
Bridgeport, Conn., U. S. A.

BULLARD

PITTSBURGH



This Triple Geared Lathe Handles Heavy Work Easily

POWER—power to excess is embodied in this Pittsburgh Triple Geared Lathe, which enables you to turn the heaviest pieces with ease and speed.

It is provided with twelve changes of speed with A. C. motor drive. The motor drive for direct current is mounted directly over the head stock and is driven with a Morse silent chain or endless belt with automatic belt tightener, which gives a smooth and durable drive.

The apron is of double plate construction. A locking device prevents the throwing in of two feeds at once.

The taper attachment is of rigid construction.

Get in touch with our nearest agent, and learn full details

PITTSBURGH MACHINE TOOL CO.
Braddock, Pa. U. S. A.

OR THE FOLLOWING AGENTS: Swind Machinery Co., Philadelphia, Pa.; Backer Machine Tool Supply Co., New York; Thompson Machinery Co., Pittsburgh, Pa.; Wolverine Machinery & Supply Co., Detroit, Mich.; W. C. Johnson & Sons Machinery Co., St. Louis, Mo.; Hendey Machine Co., Chicago, Ill.; Eccles & Smith Co., Seattle, Wash., and Portland, Ore.; Harold A. Wright, 201 Devonshire St., Boston, Mass.

macitalks
or
Set Screw Sermons
No. 3

mac-it

BRANCHES:
Boston
New York
Philadelphia
Pittsburgh
Detroit
Chicago

DON'T buy set-screws on claims or conversation. Buy them on proven strength. Take all the makes you know and try to twist their heads off.

(Then buy Mac-its).

THE STRONG, CARLISLE & HAMMOND CO., CLEVELAND

NO GUARANTEE REQUIRED FOR STAND

On October 6, 1909, when Hyatt Roller Bearing Hangers were not so well known, it was necessary to make a five year guarantee, in order to obtain an order for Hyatt Roller Bearing Hangers from the Harley-Davidson Motor Company.

But, on November 14, 1919, when Hyatt Roller Bearing Hangers had become widely known for their durability and dependability, there was no mention of a guarantee on a repeat order from this company.

Because of the ten years of reliable, economical operation received from their first Hyatt Roller Bearing Hangers, the Harley-Davidson Motor Company looks upon them as a product which **needs no guarantee.** Hyatt Roller Bearing Hangers stand on their own merits—savings in power and lubrication costs, their positive self-oiling feature and their length of life (29 years in some plants). These merits make Hyatt Roller Bearing Hangers—standardized transmission equipment.

Transmission engineers who specify Hyatt Roller Bearing Hangers can make sure of this same reliable, economical operation. Write for our bulletin No. 125 and investigate the many advantages of Hyatt Roller Bearing Hangers.

D-106

MOTOR BEARINGS DIVISION
DETROIT, MICHIGAN

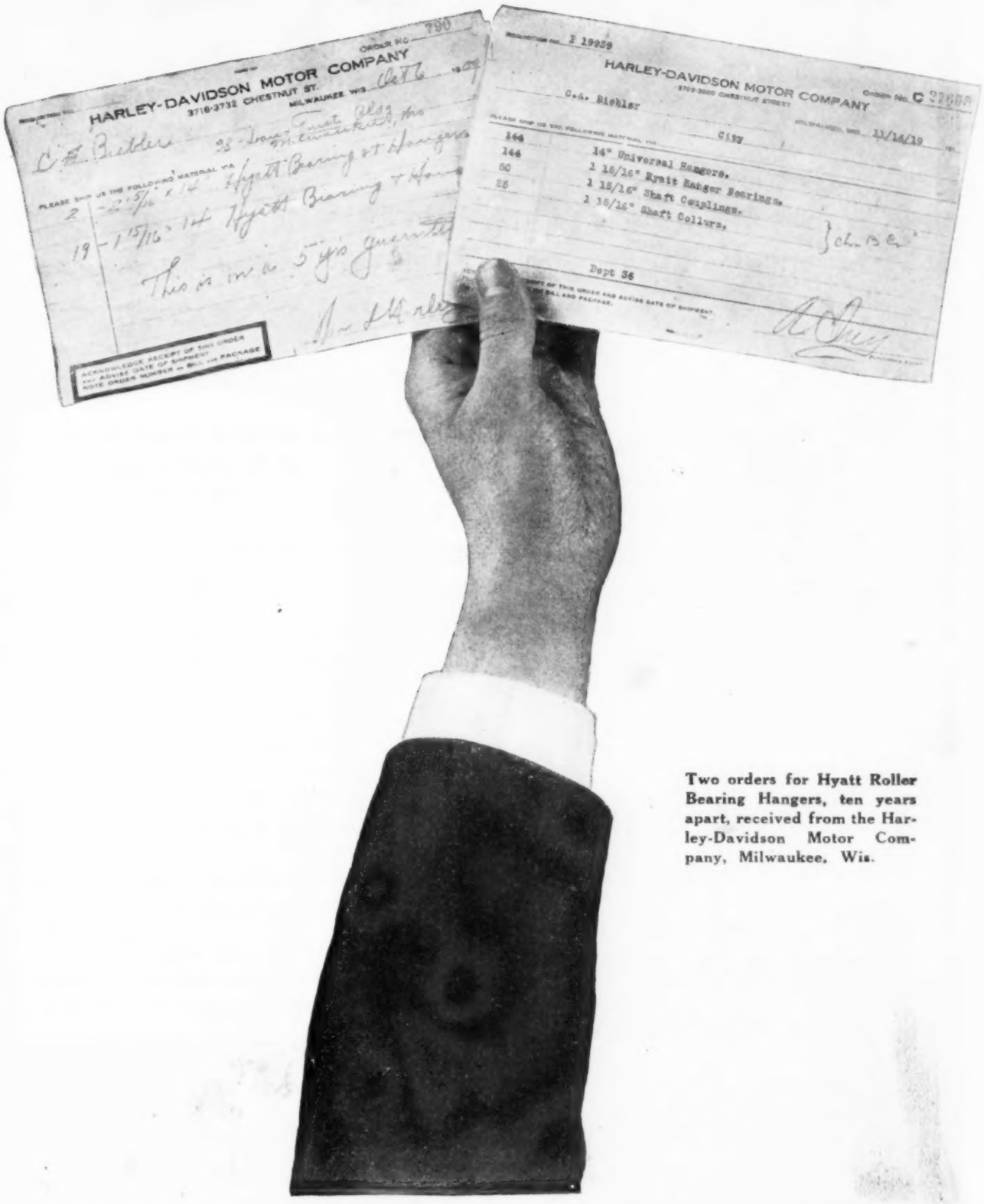
HYATT ROLLER BEARING COMPANY
INDUSTRIAL BEARINGS DIVISION
NEW YORK, N. Y.

TRACTOR BEARINGS DIVISION
CHICAGO, ILLINOIS

Manufacturers of Bearings for Mine Cars, Ore Cars, Steel Mill Cars, Roller Tables, Trolleys, Cranes, Hoists, Machine Tools, Line Shafts, Countershafts, Concrete Machinery, Textile Machinery, Conveyors, Lift Trucks, Industrial Trucks, Railway Service Cars, Storage Battery Locomotives, etc.

HYATT BEARINGS

ARDIZED TRANSMISSION EQUIPMENT



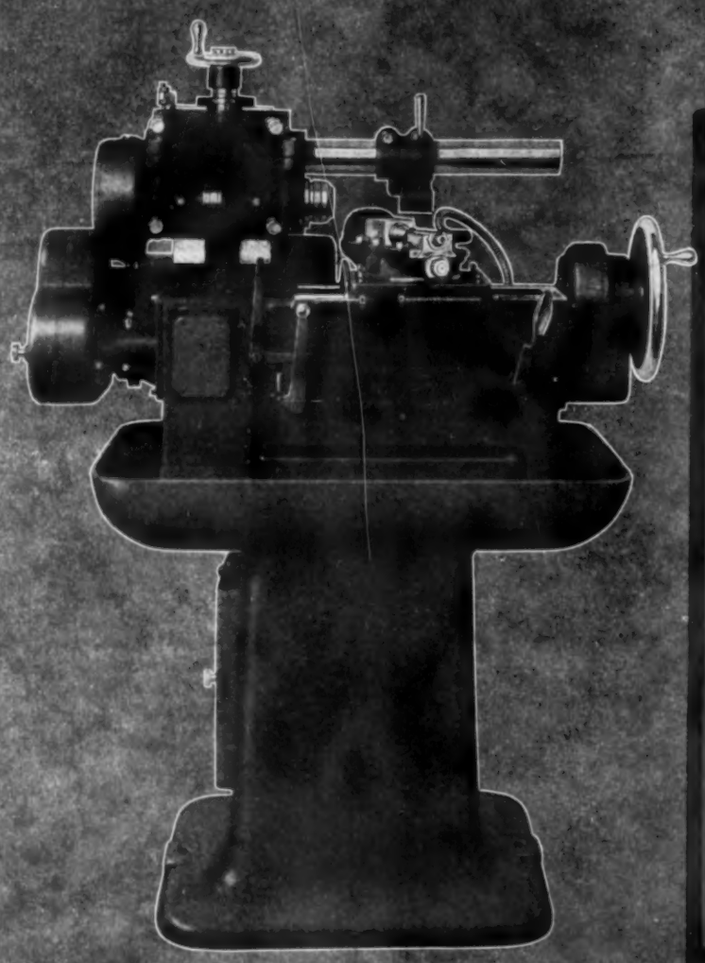
Two orders for Hyatt Roller Bearing Hangers, ten years apart, received from the Harley-Davidson Motor Company, Milwaukee, Wis.

FOR LINE SHAFTS

BARBER-

HOBBING MACHINES

ACCURATE



A MANUFACTURING MACHINE FOR GENERATING SPUR AND SPIRAL GEARS

GENERAL SPECIFICATIONS

NO. 2

Capacity, diameter	3"
Capacity, width of face	7"
Capacity, diametral pitch	24 and finer
Diameter hob spindle	½"
Maximum diameter of hob	1¼"
Taper hole in spindle	No. 9 B&S
Floor Space	27" x 42"
Driving Pulley	6" x 1⅝"
Speed of driving pulley	800 R. P. M.
No. changes of hob speed	8
Range of hob speed	200 to 800 R. P. M.
Range of feed of hob per rev. of work	.015" to .150"
Net Weight, approximately	950 lbs.
Shipping Weight, approximately	1200 lbs.
Shipping Weight, Boxed for Export	1360 lbs.

BARBER-COLMAN COMPANY

HOME OFFICE & PLANT

ROCKFORD, ILL., U.S.A.

1920-B

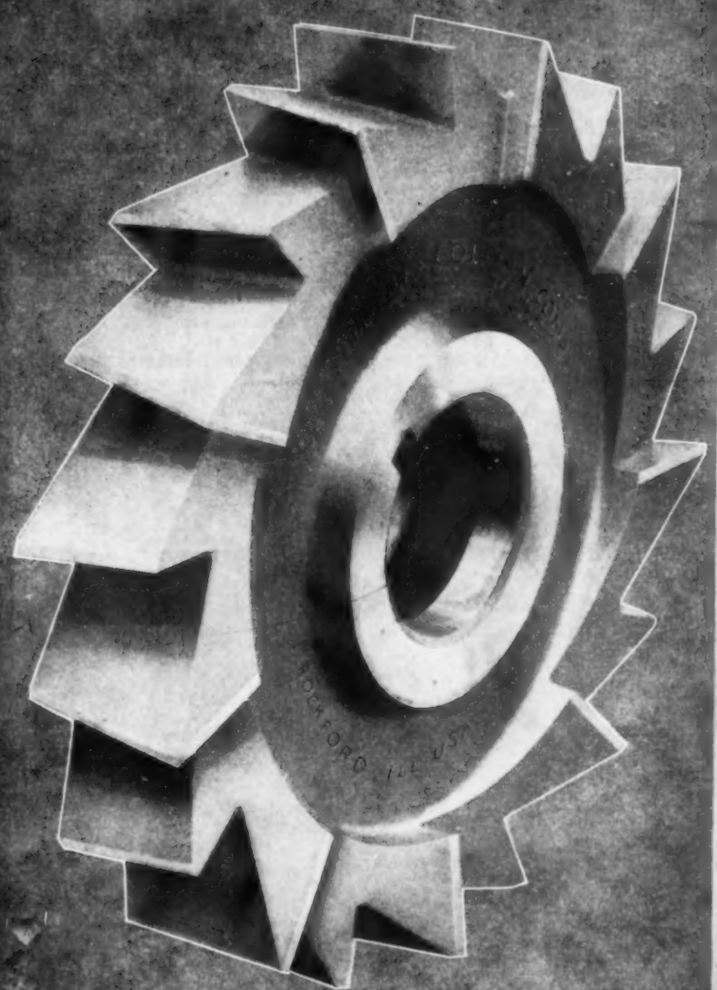
COLMAN

MILLING CUTTERS

DEPENDABLE

We are the pioneer cutter manufacturers of the middle west and have developed this department of our Plant to a high degree of perfection. Our laboratories are equipped with the most modern devices and instruments for the testing of steel, which is an assurance to our customers that our product is right before leaving the Plant.

Our engineering department will assist you in solving your cutter problems.



BRANCH OFFICES

BOSTON, MASS. BUFFALO, N.Y. CHICAGO, ILL. CLEVELAND, O.
DAYTON, O. DETROIT, MICH. MILWAUKEE, WIS. NEW YORK CITY.

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1920-8-A

Style "E" Tool—Indispensable for Turret Lathes

Style "O" Tool for Miscellaneous Boring and General Work

DAVIS EXPANSION BORING TOOLS

Micrometer Adjustment for Expanding Cutters to Compensate for Wear

Style "V" Tool—For Turret Lathes and Boring Mills

For Efficiency and Economy

Progressive mechanical officials, striving for maximum production and efficiency should insist on having all their machines that bore, equipped with Davis Expansion Boring Tools. It means an increase in boring production of 25% or more with a corresponding decrease in costs.

Davis Boring Tools are indispensable for any metal boring, especially on heavy production work, where standard sizes must be accurately maintained. This has been demonstrated in the many shops where these tools are in constant use, giving steady, dependable service every working day.

Practical cutter expansion, with rigid cutter locking, insures absolute accuracy of bore at all times—even under the fastest feeds or speeds.

Davis Expansion Boring Tools have been successfully used for boring a wide variety of jobs in general machine shops and automobile plants and they can be made up special for almost any boring operation encountered in the average shop.

Take advantage of our Engineering Service and allow us to submit for your approval and without obligation, suggestions and detailed information on the tools best adapted to your own requirements.

Write Today for Full Particulars

DAVIS BORING TOOL COMPANY

Incorporated

Forest Park Boulevard & Spring Ave., St. Louis, Mo., U. S. A.

Largest exclusive manufacturers of expansion boring tools and expansion reamers

A Measure of the Finished Product

It follows naturally that a testing machine can be no more accurate than the machine which makes it.

Accuracy is a necessary feature in machines of that sort.

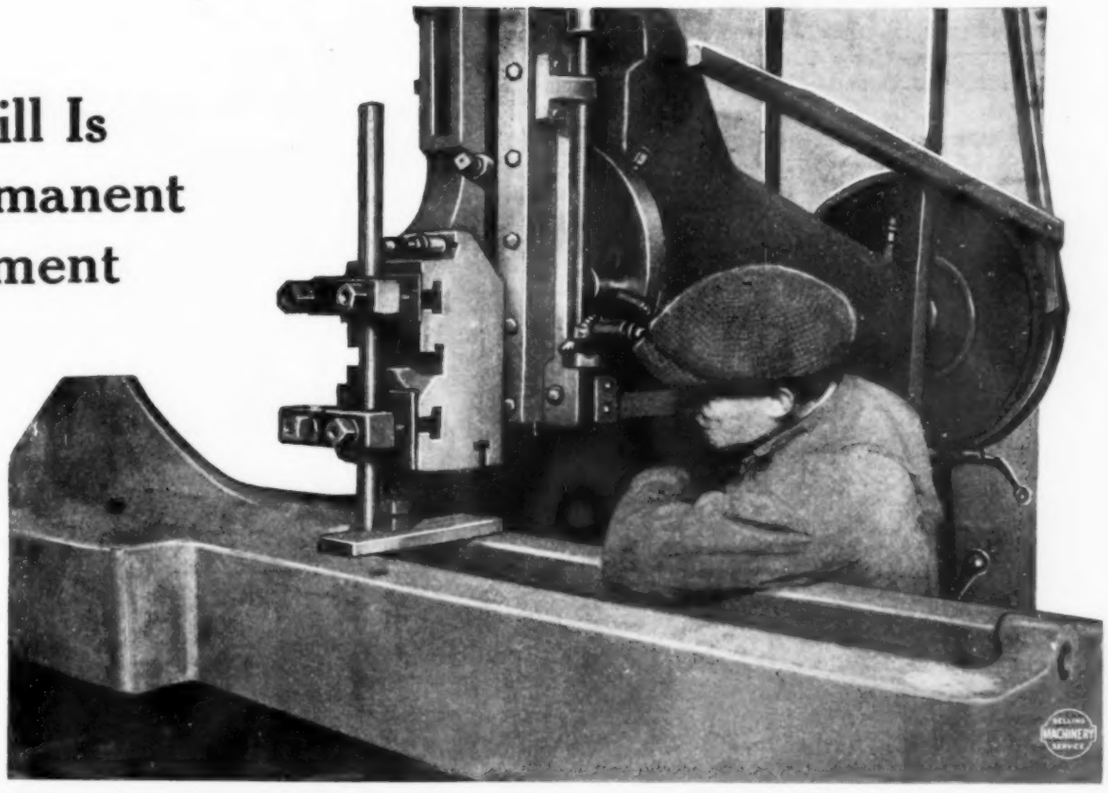
Dill Slotter Machines have a worth-while record for their accuracy, and for this reason the testing machines manufactured by The Tinius Olsen Testing Machine Company of Philadelphia are made on Dill Machines.

Have you our new catalog?

The Dill Slotter People
Kensington, Philadelphia

FOREIGN AGENTS: Alfred Herbert, Ltd., British Isles; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anoyme Belge, Alfred Herbert Brussels, Belgium; Societe Anonyme, Alfred Herbert, Ltd., Paris, France; Societa Anonima Italiana, Alfred Herbert, Ltd., Milan, Italy; Allied Machinery Co., S.A.E., Barcelona, Spain; Monteiro Gomes Ltda., Lisbon, Portugal; Allied Machinery Co. of America, Shanghai, China. Benson Bros., Ltd., Sydney, Australia.

The Dill Is A Permanent Investment



H&G

Self-Opening Die Heads

A Few Words to the Point

Did you ever look at your screw-cutting problem from this angle?

Here's the machine and here's the operator. Together they represent quite an investment. On this investment, say you make a profit of ten per cent.

If by adopting a new kind of die head you can reduce the amount of spoilage, and increase the output and the standard of the work, thereby increasing the profit, to adopt the new die head sounds like a perfectly reasonable thing to do.

We think so.

An H & G Die Head for each of your machines will not increase your investment appreciably. On the other hand, they will increase your efficiency, turn out better screws, eliminate taper-cuts, reduce production costs and—the sooner you get them the better.

Again we concur with you!

In marketing the H & G Die Head we do not claim that it is panacea for all ills a screw shop is heir to. But what we do claim and records will prove, is that H & G Die Heads cut threads better, faster, and more satisfactorily.

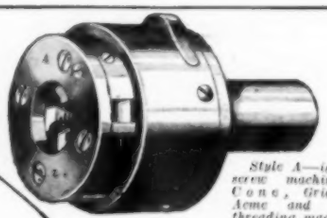
We wish the H & G to speak for itself. And to facilitate matters we will furnish Die Heads for practical tests in your own shop on your own machines, in the hands of your own operators.

Write to us today and ask about the details of this offer, and also our 96 page catalog and Data Book. This book tells all about H & G Die Heads and contains much valuable information about thread-cutting.

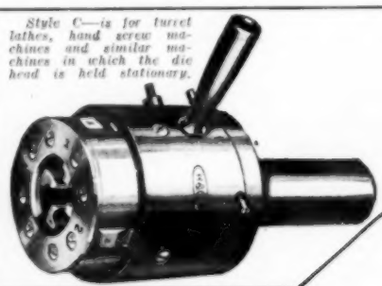
H & G Die Heads are made in three principal styles and many sizes, adaptable to practically all machines on which threading is done.

H & G WORKS—THE EASTERN MACHINE SCREW CORPORATION
20-40 Barclay Street, New Haven, Conn.

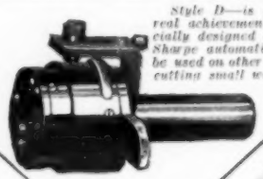
The Die Head that Revolutionized Thread-Cutting



Style A—is for automatic screw machines like the Cone, Gridley, National Acme and Radical; for threading machines and bolt cutters in which the die head rotates.



Style C—is for turret lathes, hand screw machines and similar machines in which the die head is held stationary.



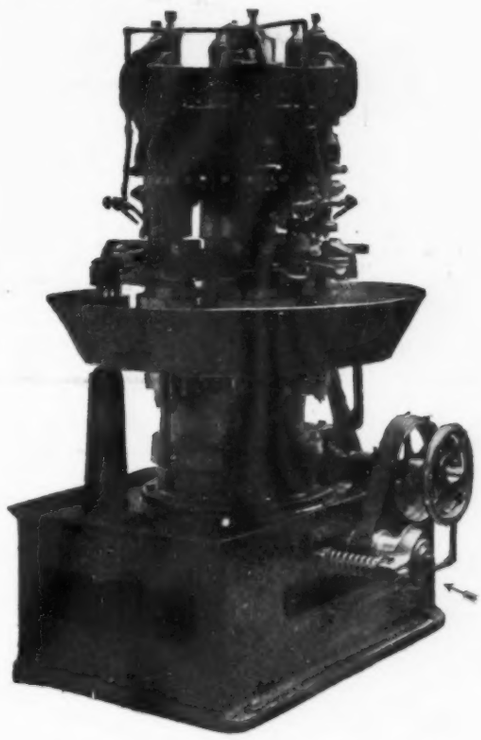
Style D—is new and it is a real achievement. It is specially designed for Brown & Sharpe automatics, but can be used on other machines cutting small work.

THE JOHNSON FRICTION CLUTCH

Builders of Special Machinery Rely on Johnson Clutch Service

Special machinery presents unusual clutch problems which in many cases cannot be handled by a clutch of standard design. That's where Johnson Clutches have the call. They are chosen for places where others fail, because we build them on engineering principles to any specifications necessary.

The Langelier Mfg. Company has learned the value of this service and has used it on many of their special machines. The Semi-Automatic Drilling Machine shown here is an example, with a Johnson Clutch controlling the power engagement. If you are building machinery that requires a friction drive, it will pay you to let us offer some suggestions.

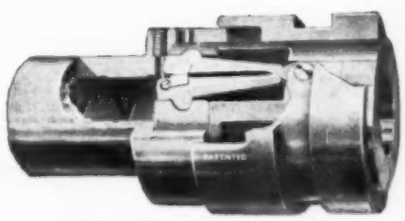


Courtesy of The Langelier Manufacturing Co., Providence, R. I.

In this series of advertisements, we are showing practical clutch installations on a great variety of machine tools and metal-working machines, as well as on textile machinery, wood-working machinery, and special machines of all kinds.

If you will tell us in what type of machinery you are interested, we will gladly supply copies of these advertisements and further data on the subject.

Our complete Booklet, *"Clutches As Applied to Machine Building,"* will be mailed on request.



Johnson Single Clutch Broken Away

Write for our Blue Catalog.

FOREIGN AGENTS:

CANADA: Williams & Wilson, 84 Inspector St., Montreal. The Canadian Fairbanks-Morse Co., Ltd., Montreal and branches. ENGLAND: The Efandem Co., Ltd., 22 Newman St., Oxford St., London, W. 1. AUSTRALIA: Edwin Wood, Pty., Ltd., 231 Elizabeth St., Melbourne, Victoria. FRANCE: Anciens Etab. Glaenzer & Perreaud, 18 Faubourg du Temple, Paris. SPAIN: R. D'Auligmac, Cortes 559, Barcelona. BELGIUM: Louis Reyners, Rue de la Buanderie 11, Brussels. HOLLAND: Louis Reijners, Kloveniersburgwal 101, Amsterdam. DENMARK and SWEDEN: Wilh. Sonesson & Co., Copenhagen and Malmo. NORWAY: Oscar C. M. Knudsen, Odinsgate 4, Christiania. ARGENTINA: Pedro Meritni, Calle Defensa 124, Buenos Aires. INDIA: J. D. Jones & Co., 56 Esplanade Road, Fort, Bombay.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

ONE FOREMAN put it up to the Purchasing Agent this way when the latter suggested buying "Just as Good" Tool Holders.

"This is a machine shop—
Not an experiment station—

Buy Armstrong!"

Specify Armstrong and Get the Best

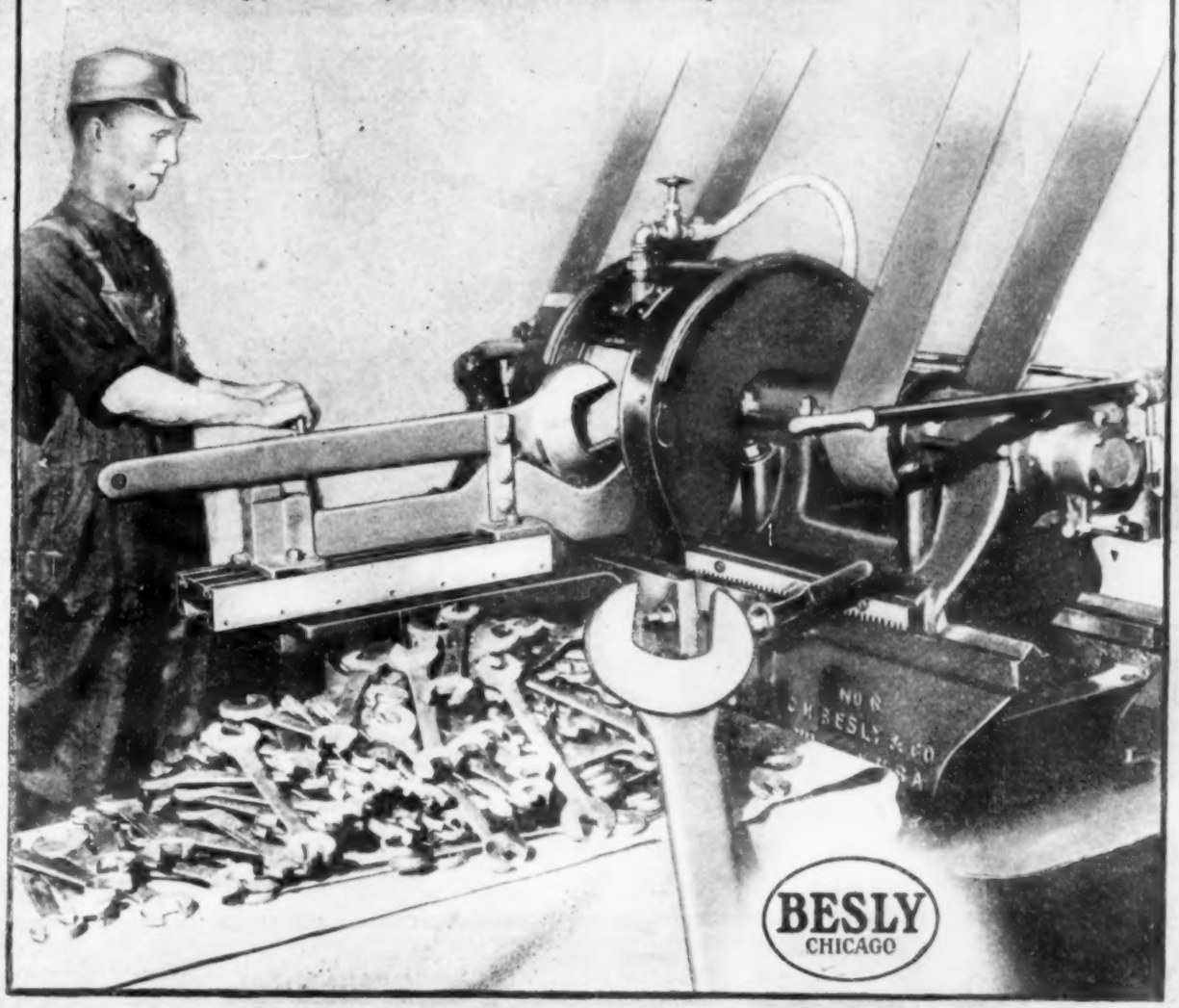
Catalog mailed free upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.

BESLY

IT'S EASY TO DO IT RIGHT ON THE RIGHT MACHINE —choosing the proper equipment is half the battle. Cost and production records tell the story why wrench manufacturers all over the country, who pride themselves on the high quality of their product are finding the No. 6 Besly Wet Ring Wheel Grinder the ideal machine for surfacing the sides of heads of large and small machine wrenches.

Outline your flat surfacing operations and let us tell you what Besly Grinders applied to your work can accomplish.



An Unusually Large Hob

Below is shown one of two hobs recently designed and made by us for The Morgan Engineering Co., of Alliance, Ohio.

SPECIFICATIONS:

3-in. Circular Pitch, Triple Thread, Right and Left Hand 15° P. A. 14-in. Diameter x 14-in. Face. O. D. Worm 13½-in.

AUTHORITY

An engineer must devote year upon year in study, research and experimentation before he becomes an authority on Hobs. An organization made up of men of this caliber naturally becomes, as an organization, authorities on Hobbing.

The Union Twist Drill Company enjoys the ability of engineers who have devoted their entire lives in the study and development of Hobs. It is only natural, then, that this organization is spoken of today as the authority on this subject.

And remember—this organization is at your service, ready and willing to give the benefit of long study and resultant knowledge in the solution of any Hobbing problem.

The following dealers are always stocked with a complete line of Standard Union Cutters:

UNION TWIST DRILL CO.

DRILL AND CUTTER MAKERS

NEW YORK **ATHOL MASS. USA** CHICAGO

DOMESTIC AGENTS:

Baltimore—Sheppard Supply & Equipment Co.
Boston—G. R. Armstrong Mfrs. Supplies.
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Cincinnati—V. N. Devou Supply Co.
Cleveland—White Tool & Supply Co.
Detroit—W. J. Baird Machinery Co.
Evansville—Evansville Supply Co.
Grand Rapids—McMullen Machinery Co.
Indianapolis—Vonnegut Machinery Co.
Louisville—Neill-LaVielle Supply Co.
Milwaukee—W. L. Romaine Machy. Co.
Minneapolis—F. E. Satterlee Co.
Philadelphia—E. M. Hanson & Co.
Pittsburgh—Somers, Fitler & Todd Co.
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San Francisco—Fred Ward & Son.
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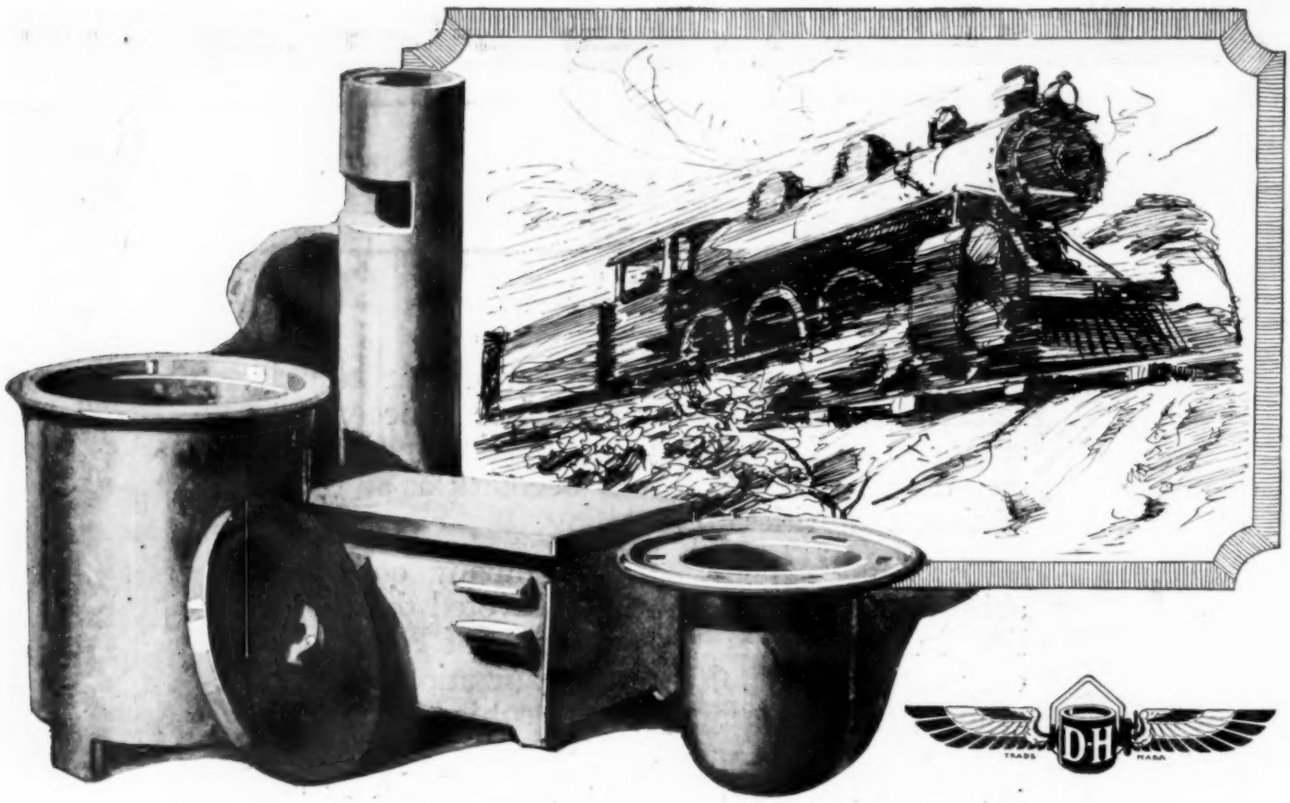
Norway—V. Lowener, Christiania.
Spain—Hijo de Miguel Mateu, Barcelona.
Sweden—V. Lowener, Stockholm.

OU BUY AGAIN"



SURE— in Economy and Results

USERS of Cast Nichrome are as far ahead in heat-treating Containers as the modern locomotive is ahead of the old stage coach.

Cast Nichrome heat-treating Containers not only serve thousands of hours at 1800 deg. F. without warping, cracking, scaling, etc. but also shorten the heats, increase furnace capacity, reduce spoilage, and save fuel and furnace floors.

More heats per dollar — more uniform results, are the direct advantages. The D-H guarantee covers thousands of hours of service and makes your economy doubly sure. Stock patterns in hundreds of sizes. Special designs made for special purposes.

Bulletin N-21 gives the details.

Manufactured under Henderson Patents by

DRIVER-HARRIS COMPANY
HARRISON, N.J.

CANADIAN WORKS
CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT. CANADA

CHICAGO
28 So. JEFFERSON ST.

DETROIT
534 FREE PRESS BLDG.

BRITISH WORKS
DRIVER, DRENNAN & COOPER
MANCHESTER, ENGLAND

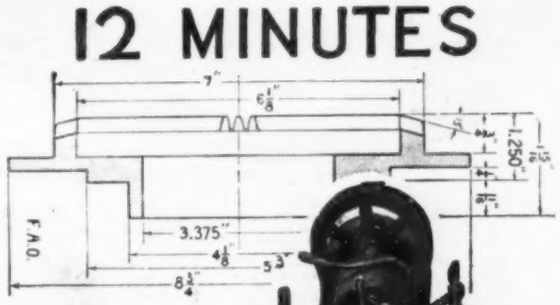
Heat-Treating Containers of

Cast Nichrome

ENDURE IN HIGH TEMPERATURE

GISHOLT

This cast iron piece was finished all over in 12 minutes on a Standard Gisholt Turret Lathe with Standard Chucking Tools.



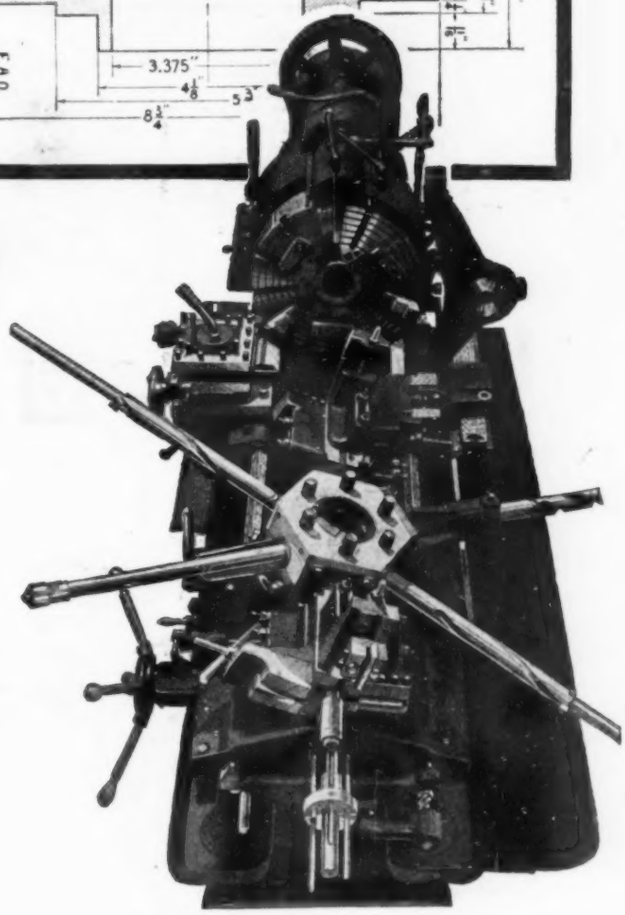
A Sample of Economical Gisholt Production

Why not transfer this time of production from paper to your shop?

The samples which we are showing each week are representative of hundreds of jobs that can be done with great rapidity on Gisholt Standard Turret Lathes.

They are doing you no good if you merely leave them on paper. Why not turn them into actual jobs and put your plant on a better production footing?

Let us send a Gisholt representative to go over your chucking problems with you and give you the benefit of Gisholt engineering experience. We'll gladly do it at no expense to you.



Standard Gisholt Turret Lathe equipped with Standard Chucking Tools

GISHOLT MACHINE CO., 1201 East Washington Ave. MADISON, WIS. U. S. A.

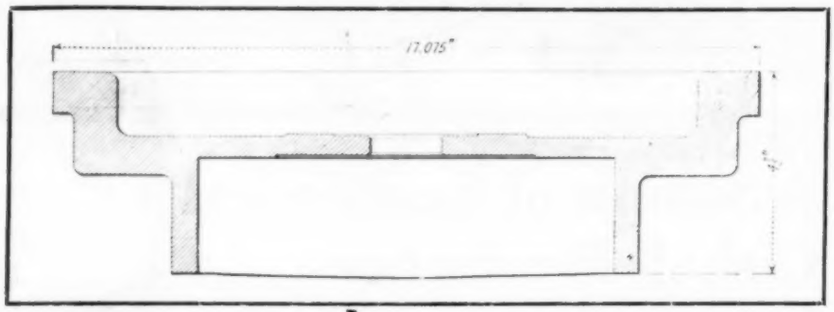
Builders of Standard and Automatic Turret Lathes, Vertical and Horizontal Boring Mills, Tool Grinders, Small Tools, Special Machinery, etc.

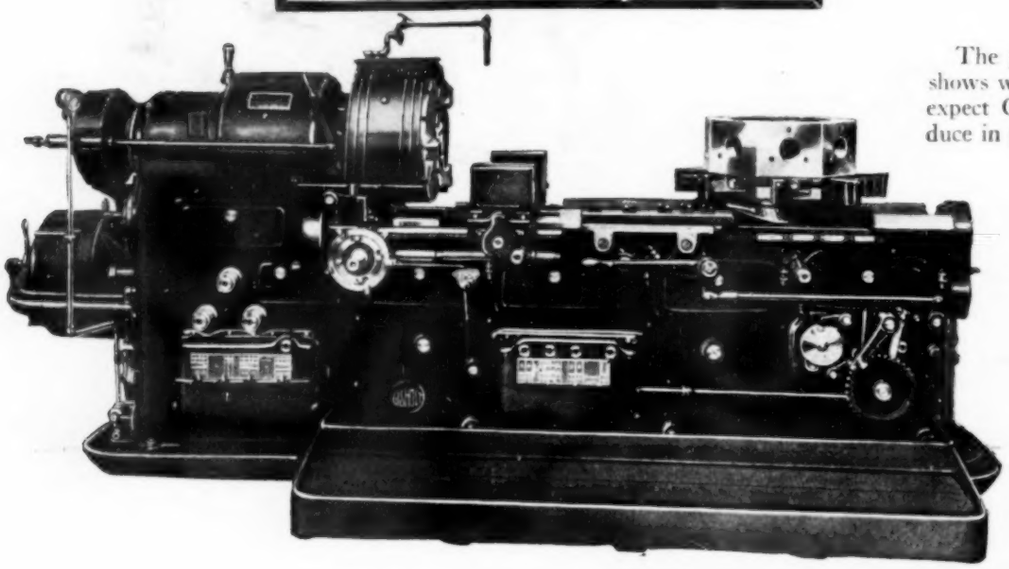
Eastern Sales Office: 30 Church St., New York. *Works:* Madison, Wis., Warren, Pa.

GIS

18 Minutes

Results For You





The piece of work on this page shows what sort of results you can expect Gisholt Automatics to produce in your shop.

Back of the machine stands a record of years of Engineering Experience devoted to the solving of manufacturing problems.

Why not let a Gisholt representative call and tell you what Gisholt Engineering Experience can do for you?

GISHOLT MACHINE COMPANY, 1201 EAST

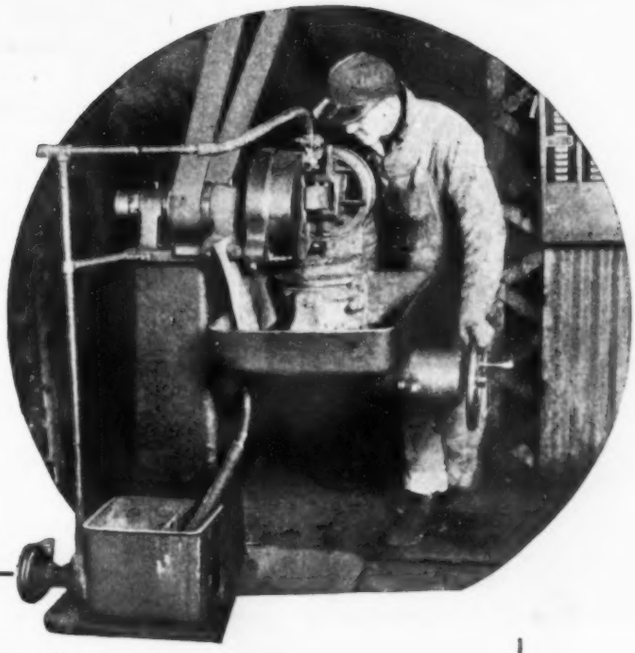
Builders of Standard and Automatic Boring Mills, Tool Grinders,

Eastern Sales Office: 30 Church St., New York

AGENTS:

Atlanta, Ga., Seeger Machine Tool Company; Buffalo, N. Y., J. L. Osgood; Chicago, Ill., Stocker-Rumely-Wachs Co.; Denver, Colo., Hendrie & Bolthoff Mfg. & Supply Co.; Detroit, Mich., Chas. A. Strelinger Company; Indianapolis, Ind., Vonnegut Machinery Co.; Los Angeles, Calif., Smith-Booth-Usher Co.; New Orleans, La., P. H. McArdle; Philadelphia, Pa., Swind Machinery Co.; Portland, Ore., Portland Machinery Co.; St. Louis, Mo., Colcord-Wright Mchy. & Supply Co.; Minneapolis, St. Paul, Minn., Savage & Winter Company; Salt Lake City, Utah, Salt Lake City Hdw. Co.; San Francisco, Calif., F. O. Stallman Supply Co.; Seattle, Wash., Perine Mchy. Company; Chattanooga, Tenn., James Supply Co.

GISHOLT



Why Not Keep Your Skilled Operators on Productive Work?

If you can keep your skilled operators continuously on productive work, economy is assured.

Gisholt Tool Grinders make this possible. Medium priced men do the grinding for your entire shop. Productive machines are kept busy. Skilled operators earn their pay. Tools last longer and the work is better.

A Gisholt Tool Grinder will soon pay its cost; after that the saving is all clear profit.

Let us send you an interesting catalog that tells the full story.

WASHINGTON AVE., MADISON, WIS., U. S. A.

Turret Lathes, Vertical and Horizontal Small Tools, Special Machinery, etc.

Works: Madison, Wis., Warren, Pa.

Canada: Canadian Fairbanks-Morse Co., Calgary, Hamilton, Montreal, Ottawa, Quebec, St. John, Toronto, Vancouver, Winnipeg.

FOREIGN:

Australia, Benson Bros., Sydney, Melbourne; Belgium, Ateliers Demoor, Brussels; Great Britain, Burton, Griffiths & Co., London, Birmingham, Manchester and Glasgow, Scotland; France, Aux Forges de Vulcain, Paris; Italy, Emanuele Mascherpa, Milan; Japan, Andrews & George, Tokyo; Norway, Union Machine Co., Christiania; Sweden, Axel Ryden, Stockholm; Switzerland. J. Lambercier & Co., Geneva.

GISHOLT

Controlling Output Means Controlling Cost

Orders for operations are given in the form of Periodograph Time Tickets. The Periodograph ticket becomes the production order for that operation. Workmen record their time accurately.

The accuracy of the final cost report depends on how output is controlled.

Guesswork methods in the shop mean guesswork in the cost report.

THE PERIODOGRAPH helps keep the lines of production open and assures that every man and every machine is carrying a full share of the load.

Controlled output means controlled costs. Why not let a Gisholt representative call and show you how the Periodograph can benefit you?

GISHOLT MACHINE CO., 1201 East Washington Ave. MADISON, WIS., U. S. A.

Eastern Sales Office: 30 Church St., New York *Works:* Madison, Wis.; Warren, Pa.
Agent: F. A. Thomas Co., San Francisco, Calif.
Agents:
F. A. Thomas Co., San Francisco, Calif.; Corporation Appliances Co., Chicago, Ill.

GODDARD TOOL CO.

Milling Cutters, Hobs, Jigs, Fixtures, Gauges Delivered Promptly

(*Main Office and Plant*)
CHICAGO

Stocks of Standard Milling Cutters and Hobs also carried at both Philadelphia and Dayton Offices.

(*Michigan Factory*)
DETROIT

LANDIS

Internal Attachments *enhance* LANDIS Versatility

There is always one *better* way of doing a piece of work, and the *better* way in Internal Grinding is to have the suitable Internal Attachment.

LANDIS Internal Attachments are made in seven sizes, and one of these—your choice—is regularly furnished with each LANDIS, Universal or Internal Grinding Machine.

You can add materially to your capacity and your profits by including additional attachments in your original order.

All of these Attachments can be used on any size of LANDIS Universal or Internal Grinding Machine, and both your tool room and manufacturing departments will be kept at "peak" by this added equipment.

You can make no safer economical investment.

Send us blueprints or sketches of your work and we will select the proper attachments for doing it. Also, include your request for our latest literature.

Domestic Agents: Dewstoe Machine Tool Co., Birmingham; Elliott & Stephens Machinery Co., St. Louis; F. C. Richmond Machinery Co., Salt Lake City; Hallidie Machinery Company, Seattle; Harron, Rickard & McCone, San Francisco and Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Seeger Machine Tool Co., Atlanta; Sheehan-North Co., El Paso.

LANDIS TOOL

Waynesboro,

New York Office:

The LANDIS Universal Grinding Machine

is a thoroughly dependable tool on *all* classes of grinding. It is decidedly "at home" on straight, taper, internal or external operations.

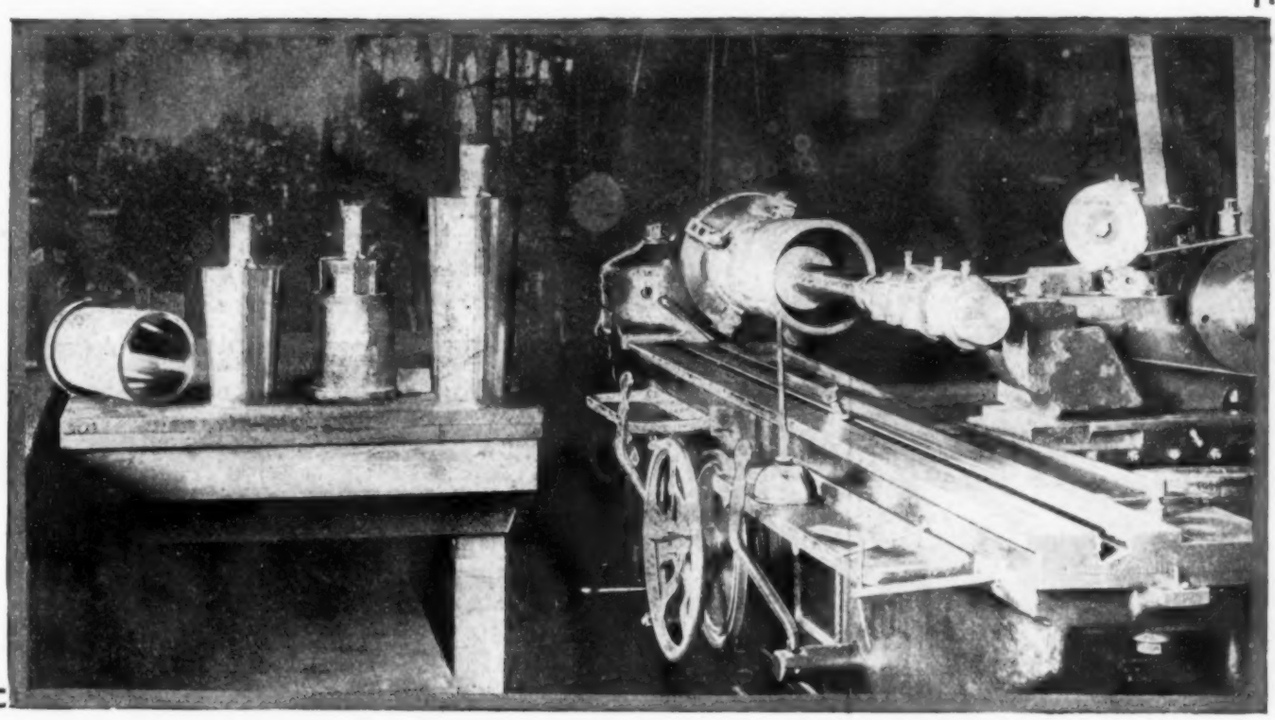
Rapidity—a prime factor in keeping order books cleared.

Precision—indispensable in duplicate grinding.

Long Life—true equipment economy. And, the illustration below proves its *absolute rigidity*. Will your machine grind a taper of this length that can be passed as a master gauge? The LANDIS Universal *can* and *does*.

Seven Standard Sizes
of Internal Attachment

No. 1—For holes ¼-in to ½-in. diam., 1½-in. deep.
No. 2—For holes ½-in. to ¾-in. diam., 3¼-in. deep.
No. 3—For holes ¾-in. to 1½-in. diam., 4¼-in. deep.
No. 4—For holes 1-in. to 2-in. diam., 5½-in. deep.
No. 4½—For holes 1½-in. to 3-in. diam., 6½-in deep.
No. 5—For holes 2-in. to 4-in. diam., 8-in. deep.
No. 6—For holes 3½-in. and larger diam., 12-in. deep.



COMPANY
Pennsylvania
50 Church St.

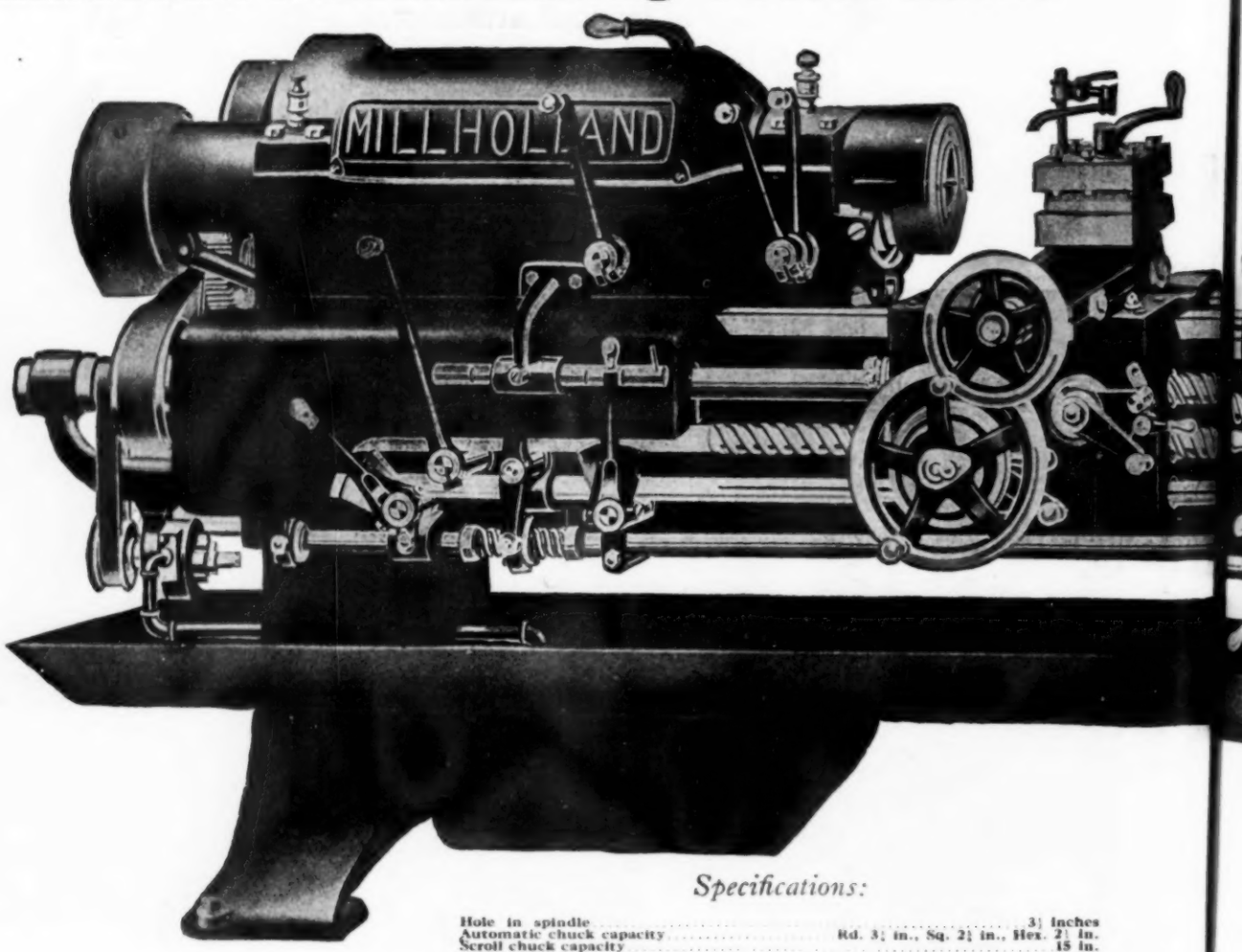
Canadian Agents: A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal.

Foreign Agents: Allied Machinery Co., Paris, Turin, Barcelona, Brussels, Zurich and Lisbon; Anderson, Meyer & Co., Ltd., Shanghai; Andrews & George Co., Ltd., Tokyo; Benson Brothers, Sydney and Melbourne; Burton, Griffiths & Co., Ltd., London; Wilh. Sonesson & Co., Ltd., Malmo and Copenhagen.

MILLHO

THE Machine *for* Heavy, Continuous Production

3½ x 36
Millholland Manufacturing Turret Lathe



Specifications:

Hole in spindle	3⅛ inches
Automatic chuck capacity	Rd. 3⅛ in., Sq. 2⅛ in., Hex. 2⅛ in.
Scroll chuck capacity	15 in.
Swing maximum over ways	19⅛ in.
Over carriage	15 in.
Travel of turret saddle	36 in. turning capacity
Turret diameter across face	16 in.
Feeds (revolution of spindle to feed per inch)	2, 4, 8, 16, 32, 64, 128, 256
Carriage—cross travel, 9 in.; longitudinal travel, 36 in.; feeds longitudinal (revolution of spindle to feed, 1 in.)	2, 4, 8, 16, 32, 64, 128, 256
Cross feeds	approximately half of longitudinal feeds
Single pulley drive; pulley diameter 14 in.; width of belt 4 in.; speed	400 R.P.M.
Spindle speeds	18, 25, 38, 53, 76, 110, 165, 240
Threading capacity	3⅛ in.
Wright net, approximately 6500; weight crated; approximately	6,70

Agents in All Principal Buying Centers.

MILLHOLLAND MACHINE

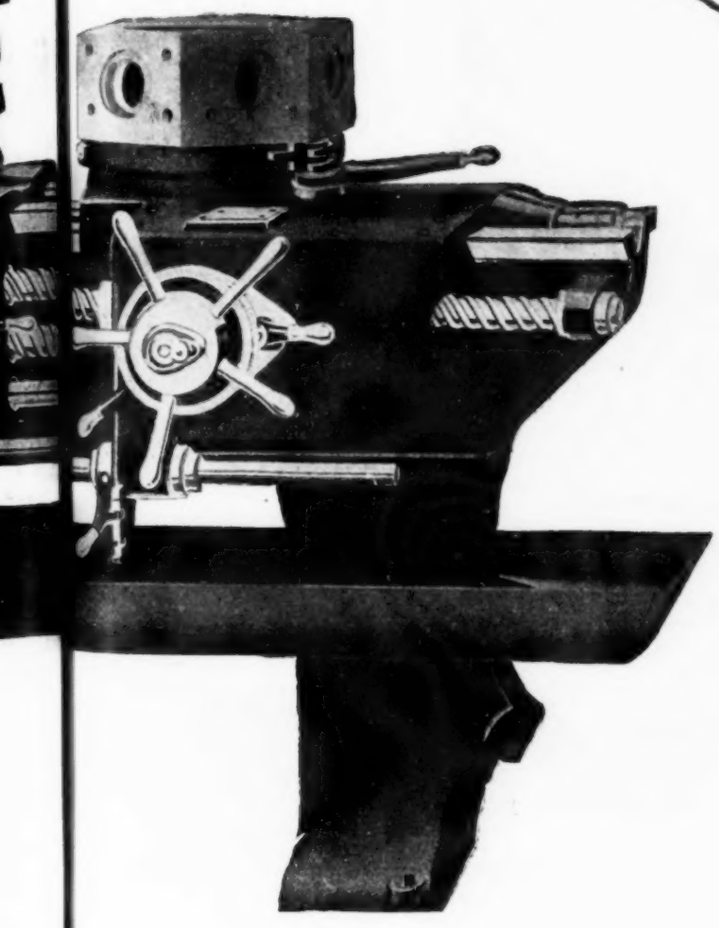
ESTABLISHED

DLLAND

TURRET

MILLHOLLAND

LATHES



For heavy, continuous production, there is no better machine than the 3½ x 36 Millholland Manufacturing Turret Lathe. It is an especially valuable machine for the automotive plant, and in shops where large quantities of duplicate parts are produced.

The 3¼ x 36 Millholland was originally made to do work within certain limits. But as it becomes more widely known, and as more of the larger manufacturing plants adopted it, its capabilities ranged to far greater dimensions than we had ever anticipated.

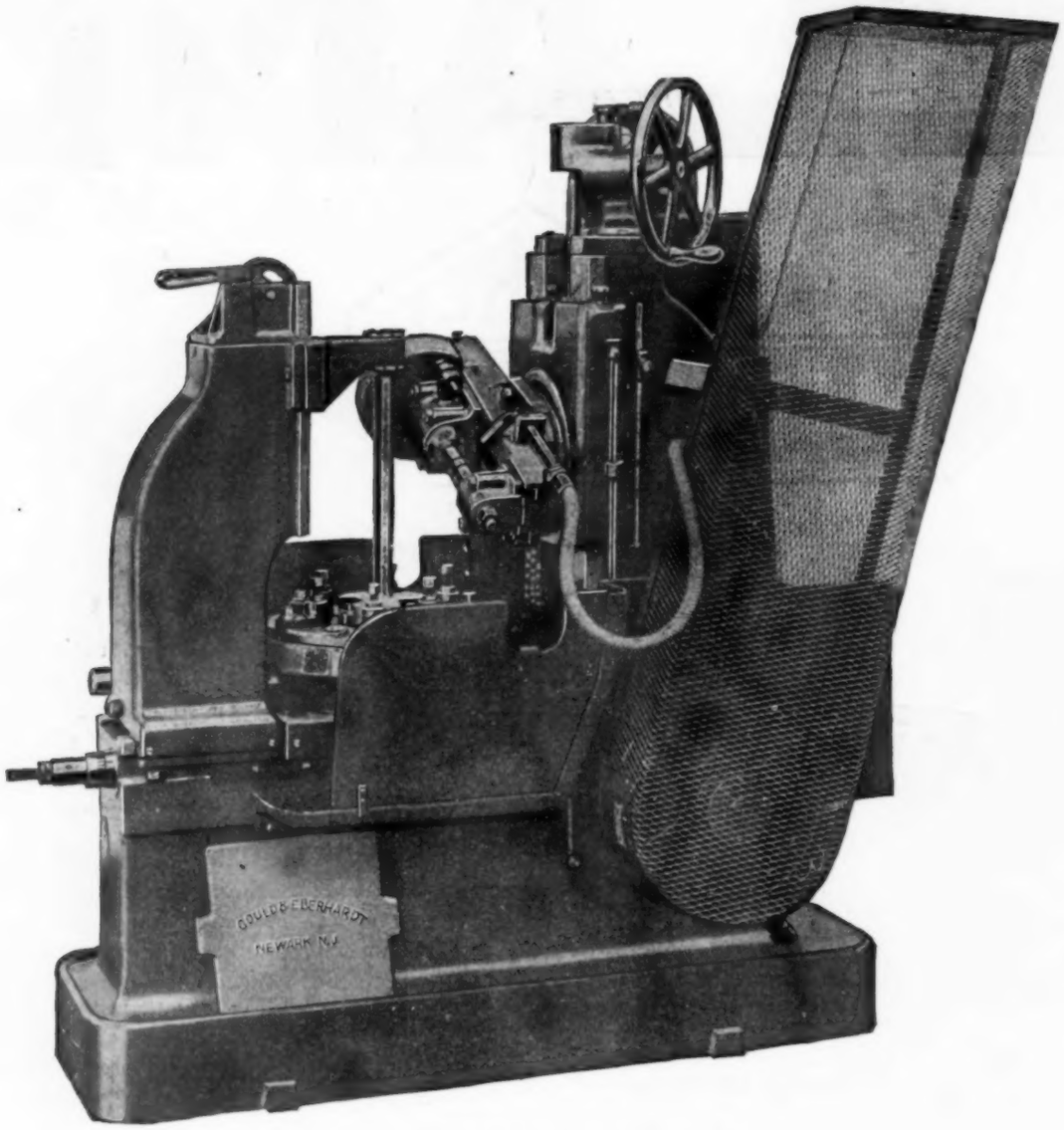
And as it stands now, the production limits of the 3¼ x 36 Manufacturing Turret Lathe are limited only by the ability of the cutting tools to remove the stock.

CO., Indianapolis, Ind.

IN 1879

New York Office:
111 Broadway, Suite 622

CUT YOUR OWN GEARS ON GOULD



No. 18-H Hobbing Machine

GOULD & E

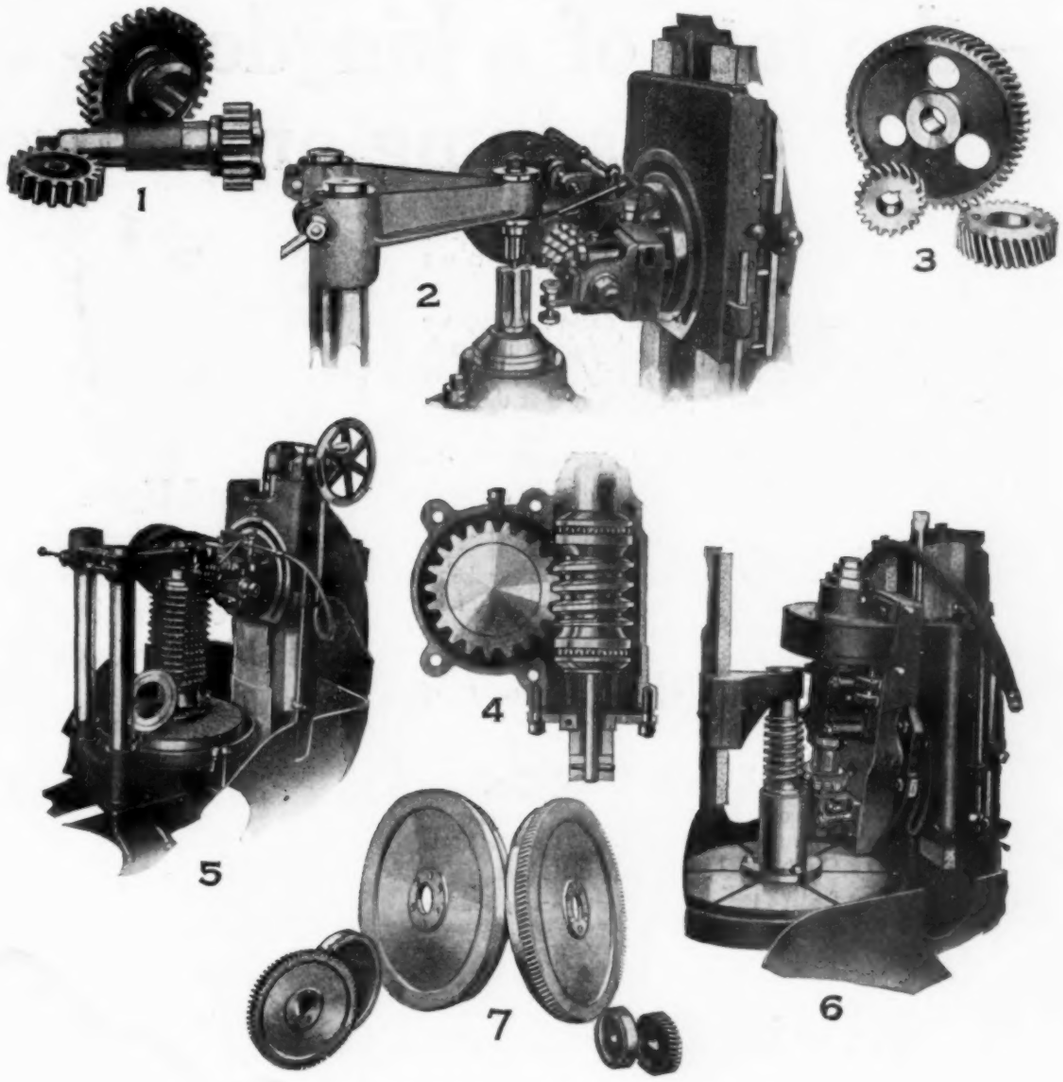
"HIGH DUTY"
AUTOMATIC GEAR AND

ESTABLISHED 1833

DOMESTIC AGENTS:

Motch & Merryweather Machinery Co., Cleveland, Pittsburgh, Detroit and Cincinnati; Henry Prentiss & Co., New York, Boston, Buffalo, Syracuse, Rochester, Scranton; Marshall & Huschart Machinery Co., Chicago and Milwaukee; Marshall & Huschart Machinery Co. of Indianapolis, Indianapolis, Ind.; Elliott & Stephens Machinery Co., St. Louis; W. E. Shipley Machinery Co., Philadelphia; Kemp Machinery Co., Baltimore and Richmond; Hallidie Machinery Co., Seattle; Dewstoe Machine Tool Co., Birmingham, Ala.; Seeger Machine Tool Co., Atlanta, Ga.; Robinson Carey & Sands Co., St. Paul and Duluth, Minn.; Eccles & Smith Co., Los Angeles, San Francisco and Portland, Ore.; Salt Lake Hardware Co., Salt Lake City, Utah; Oliver H. Van Horn Co., Inc., New Orleans, La.

& EBERHARDT HOBBING MACHINE



No. 18-H Hobbing Machine Product

1. Transmission gears
2. Splines
3. Timing gears
4. Steering worm wheels
5. Sprockets
6. Steering worms
7. Fly wheels and starter rings

BERHARDT

SHAPERS
RACK CUTTING MACHINERY

NEWARK, N.J. U.S.A.

FOREIGN AGENTS:

C. W. Burton Griffiths & Co., London, England; R. S. Stokvis & Zonen, Ltd., Rotterdam; R. S. Stokvis & Fils, S.A. Paris and Brussels; D. Drury & Co., Johannesburg, South Africa; A. R. Williams Machinery Co., Canada; Horne Co., Ltd., Tokyo, Japan; Victor G. Mendoza, Havana, Cuba; Allied Machinery Co. of America, Switzerland, Italy, China, Spain and Portugal; Chr. A. Herstad, Copenhagen, Denmark; Pedro Martinto, Lima, Peru, South America.

—the fate of a kingdom has hung on a thread

The proverbial thread and its big, important job suggests the other thread and the faith and responsibility ofttimes placed in it.

So long as it's a good little thread and doesn't cut up we don't pay much attention to it. Its faithfulness makes it insignificant. It becomes conspicuous only when it goes wrong—or when such a strain is put upon it that there's a suspicion it'll go wrong.

The more reliable the threading tool the more reliable the thread. A poor baker can't make a good loaf—he can only make believe.

You can rely upon Murchey Adjustable Solid Tap to make a thread that any solid tap will make—and to make it quickly and far more economically, too. The secret of its cost-saving lies in its adjustable features. When it wears down just regrind the chasers and readjust.

Remember!—tools on approval—prompt shipment of chasers.

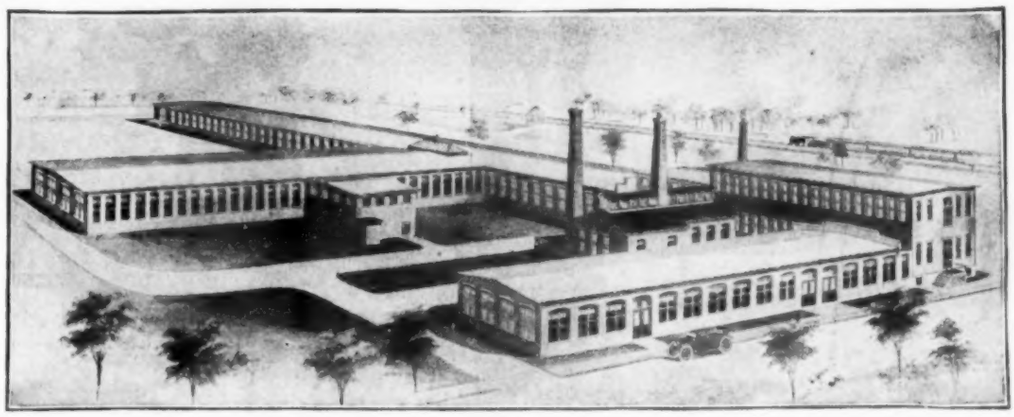
Depend Upon

MURCHEY

Tools for Making Reliable Threads

Murchey Machine & Tool Co.
Detroit, Michigan
New York Office: 99 Warren St. Cleveland Office: 511 Schofield Bldg.
UNITED STATES OF AMERICA
Coats Machine Tool Co., 14 Palmer St., Westminster, London, S. W., England. Fenwick Freres & Co., Paris, France.

UP NEW ENGLAND WAY THIS SUMMER?



Drive Round Wrentham Way For a Hand Shake and a Visit

We feel sure many of our customers and other friends will be vacationing or touring in New England the next few months. If your summer itinerary includes New England we'd like ever so well to have you call at our plant, look us over and exchange a friendly greeting.

Take out your Blue Book and glance along the main automobile route between Providence, R. I., and Boston Mass., and you'll easily find Wrentham.

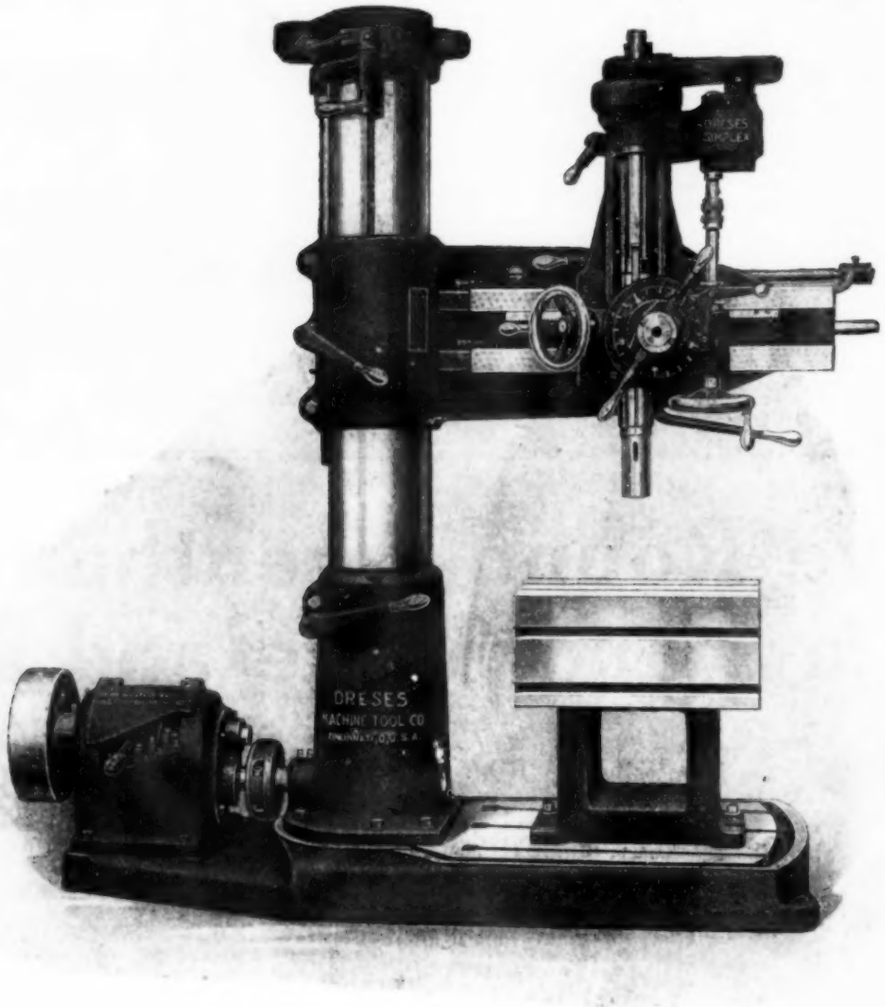
Don't forget, now! Visitors always welcome.

WINTER BROS.

For Quality Taps and Dies

Wrentham Mass. U.S.A.

New 2½ and 3 Ft. Simplex Radial Drills



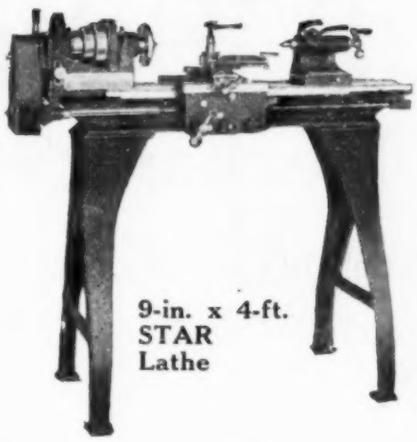
THESE machines have been designed for **high speed, heavy duty, noiseless running,** and to meet the demand for **simple radials** which can be **operated by untrained labor.** All mechanisms are condensed in simplest form so as to make the **oiling easy,** reduce the **wear and tear,** and **eliminating chances of getting out of order.**

They **lack,** however, **none of the features for rapid production** found in other drills of the same size.

They are furnished with cone or motor drives, swinging, tilting or universal tables, and with oil pump and fittings.

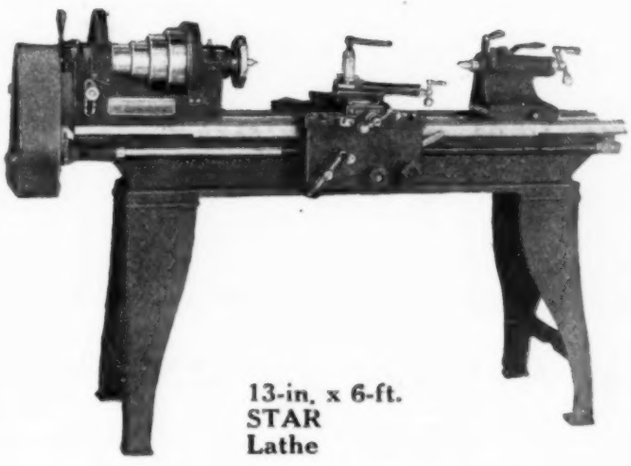
We build them in conjunction with our 3 ft. to 7 ft. High Duty Radials.

Dreses Machine Tool Co., Cincinnati, Ohio, U. S. A.



9-in. x 4-ft.
STAR
Lathe

11-in. x 5-ft.
STAR
Lathe
on Oil Pan



13-in. x 6-ft.
STAR
Lathe

STAR LATHES

For Small Accurate Tool Room and Machine Shop Production

It is not profitable practice to tool up and operate heavy machine tools on light manufacturing.

It was common practice in the past but the manufacturers of today are realizing that it pays to fit the machine to the job.

"Star" Lathes are recognized for their wide range and superior quality in the shops of the most prominent manufacturers.

The materials, entering into their construction are the highest procurable and they are built by specialists in one of the most modern plants in this country.

"Star" Lathes are rigid, sturdy and speedy. Their accuracy can never be questioned and they remain true throughout their extremely long life.

Save the big tools for the heavy jobs and place the little ones where they will make more profit for you—*on "Star" Lathes.*

Let us have your request for a copy of the "Star" Catalog. It is well worth your study.

The Seneca Falls Mfg. Co., Inc.

387 Fall St., Seneca Falls, N. Y.

W & S Turret

at the Master Mechanics and

Young's Million Dollar Pier, Atlantic City, N. J.

You can get up close to the turret lathes and see them work. You can examine the work itself as closely as you like. You can ask questions about your own work. We send men to these conventions who know W & S Turret Lathes, and they like to be quizzed—so bring a list of questions if you like—the more the merrier.

Better come and see for yourself.

Here's an opportunity to compare what a W & S Turret Lathe can do with what is being done in your own shop.

We're showing three turret lathes in operation at the M. M. & M. C. B. convention this year:

A No. 2A on a bar job—a stud
(On opposite page)

A No. 3A finishing a gear blank

A No. 6 machining a clutch cone

and Stellite cutting tools on two of the machines.

If you are not going to be in Atlantic City during that time, write for our new booklet "Turret Lathes in Railroad Shops."

Specifications of machines demonstrating:

No. 2-A Universal Hollow Hexagon Turret Lathe—

3¼ in. x 29 in. Bar Capacity—12½ in. Chucking Capacity

No. 3-A Universal Hollow Hexagon Turret Lathe—

4½ in. x 44 in. Bar Capacity—16½ in. Chucking Capacity

No. 6 Double Friction Back Geared Turret Lathe—

2¼ in. Bar Capacity—20⅜ in. Swing

THE WARNER & SWASEY

Branch Sales Offices: NEW YORK: Singer Building BOSTON: Oliver Building BUFFALO: Iroquois Building

DOMESTIC AGENTS:
Fulton Supply Company, Atlanta, Ga.
Young & Vann Supply Company, Birmingham, Ala.
Woodward, Wight & Company, New Orleans, La.
Salt Lake Hardware Company, Salt Lake City, Utah.
Smith-Booth-Usher Company, Los Angeles, Calif.
Fred Ward & Son, San Francisco, Calif.
Portland Machinery Company, Portland, Oregon.
Hallidie Machinery Company, Seattle, Washington.
Hendrie & Bolthoff Mfg. & Supply Company, Denver, Col.
Peden Iron & Steel Company, Houston, Texas.

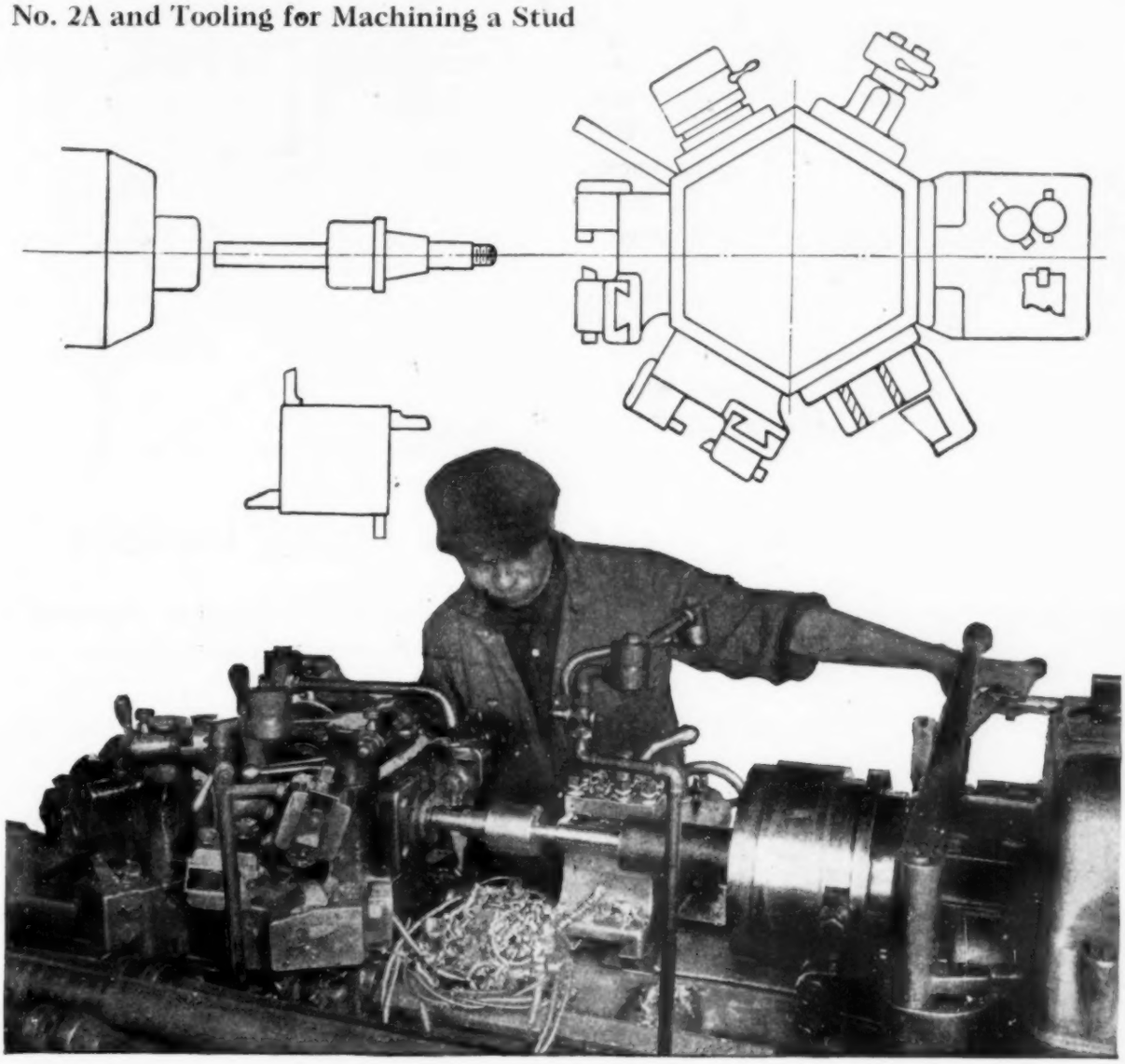
CANADIAN AGENTS:
A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

Lathes in Operation

Master Car Builders Convention

June 9th to 16th—Spaces 145 to 147

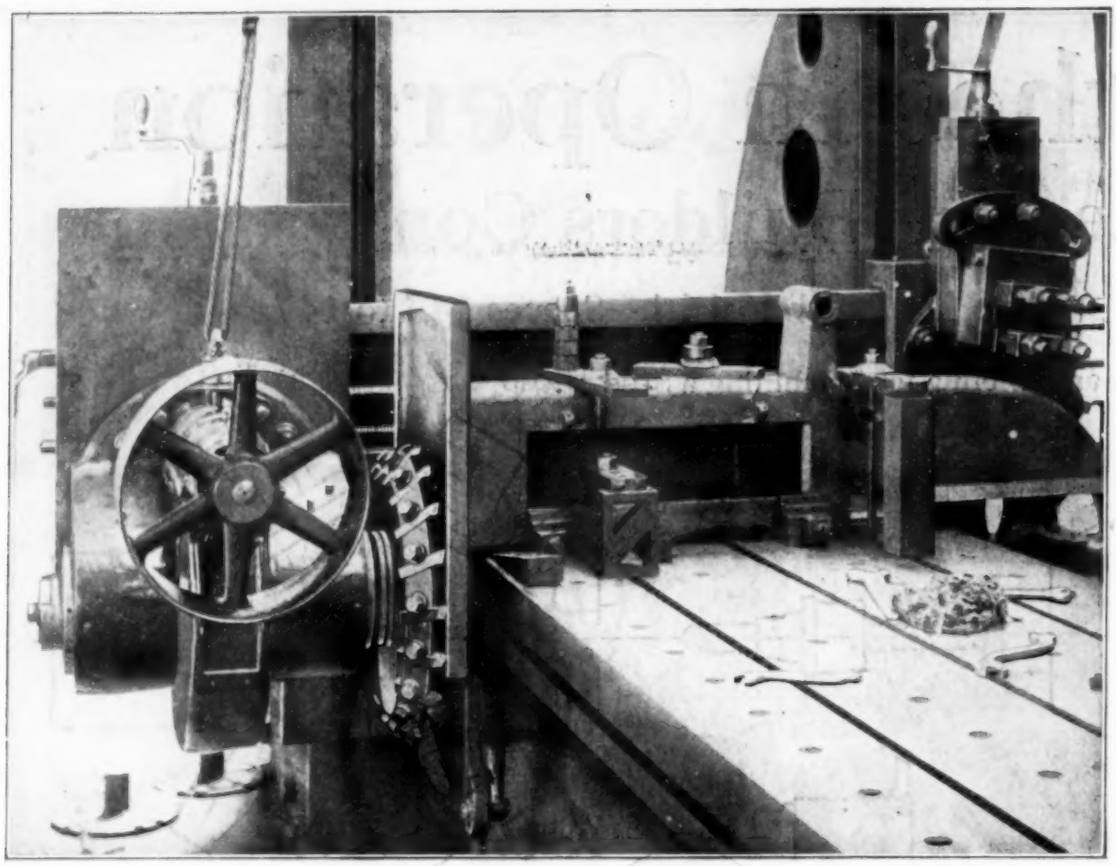
No. 2A and Tooling for Machining a Stud



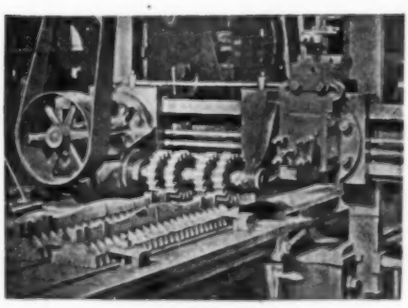
COMPANY, Cleveland, Ohio

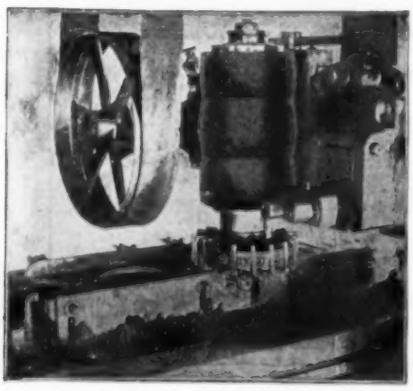
DETROIT: Ford Building CHICAGO OFFICE AND SHOW ROOM: 618-622 Washington Boulevard

FOREIGN AGENTS:
Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stokvis en Zonen, Rotterdam.
Benson Brothers, Sydney, Melbourne, Adelaide.
Yamatake & Company, Tokyo.
McLeod & Company, Calcutta.
Anderson, Meyer & Company, Ltd., Shanghai, Tientsin, Pekin, Hankow, Canton, Yumanfu, Changhau, Kalgan.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.



Farwell Milling Machines *for* Planers





It is on just such jobs as these that the Farwell Milling Machine for Planers demonstrates its real worth.

THE large cut at the top shows a No. 3 Farwell Milling Machine equipped with an 18-inch face mill. Ordinarily to face the bottom of this stand an unusually large planer or milling machine would be required, but it is rapidly and economically accomplished with this much-less-expensive tool.

The two small cuts at the left demonstrate partially the adaptability of this tool as a vertical miller and a gang miller. The lower cut of the two shows a Farwell in operation at the plant of the O. S. Walker & Co., of Boston, and the one above is in the plant of the Link Belt Co., of Chicago.

These machines do not interfere with the original usefulness of a planer.

Ask for a copy of Catalog No. 58, which gives the complete details

THE ADAMS COMPANY

Established 1883

1908 Bridge St., Dubuque, Iowa

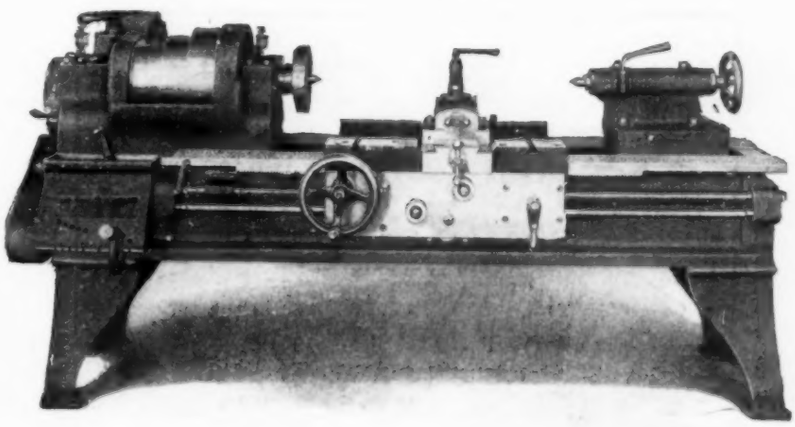
FLATHER

18-in. Double Back Geared Lathe

For over 50 years our one business has been to manufacture lathes. Every bit of our knowledge and experience goes into every Flather lathe. That is why they are so satisfactory.

The lathe illustrated is but one of a most complete line. Let us consult with you on your requirements.

Flather & Co., Inc.
Nashua, N. H.

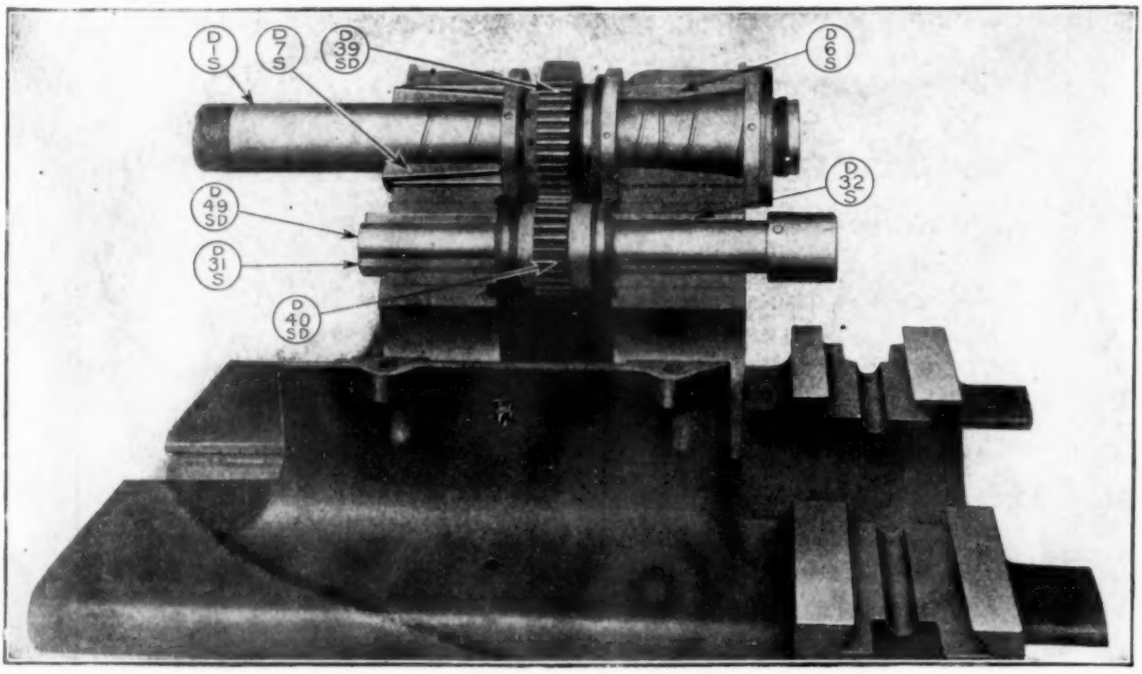


"It's RADICAL and It's RIGHT"

—Study this cut for one minute and thirty seconds and the Realness of RADICAL SIMPLICITY will appeal to you—

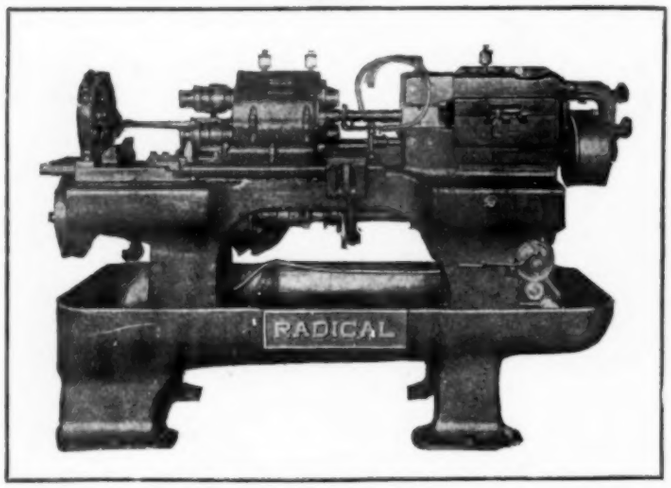
The Design and Drive of the Radical Spindle Mechanism is but one of the characteristics which have made possible

RADICAL SIMPLICITY



THE

RADICAL



AUTOMATIC

Springfield Automatic Screw Machine Corporation

Middle West Sales Office:
74 Brush St.,
Detroit, Mich.

Fitchburg, Mass.

Eastern Sales Office:
320 Fifth Ave., Room 912
New York, N. Y.

So-swing

Makes taper and parallel cuts simultaneously— And 4 more cuts besides—

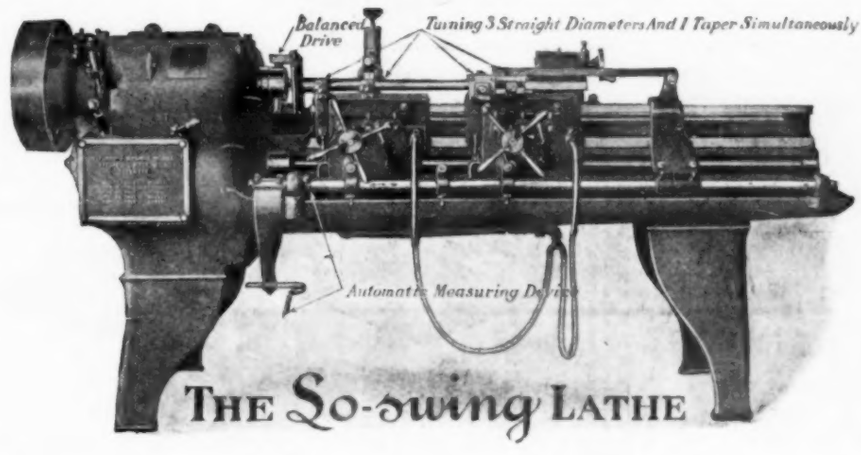
Think of being able to make taper and parallel cuts simultaneously while four other cuttings are being made. This is what can be done with the **So-swing**

It is a machine of compound energy and power, pulling from 2 to 6 tools, cutting simultaneously, on shaft work up to 3½ in. Exceptionally convenient.

We'll be glad to tell what this machine can do for you.

Fitchburg Machine Works

Fitchburg, Massachusetts



THE So-swing LATHE

Standard the Country Over

See the Dealer Nearest You

American Agents for Dies and Chasers:

Boyer-Campbell Co., Detroit.
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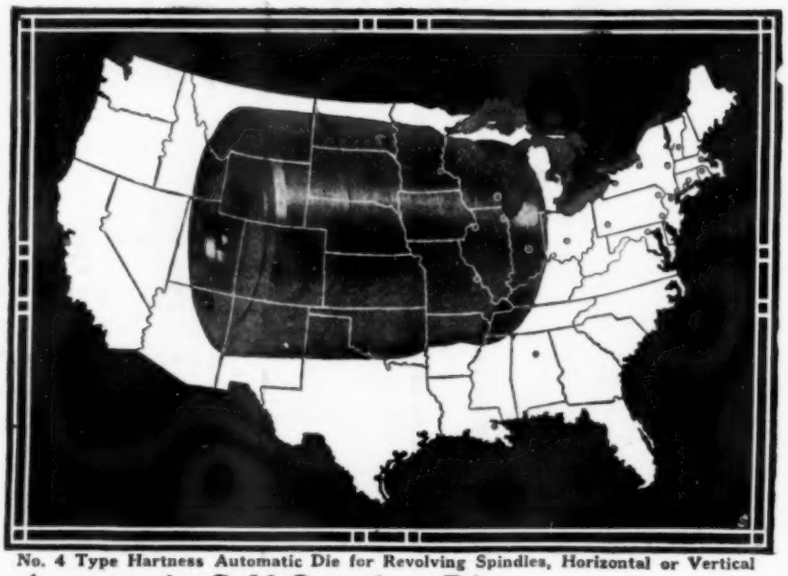

No. 4 Type Hartness Automatic Die for Revolving Spindles, Horizontal or Vertical

Hartness Automatic Self-Opening Dies

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AUTOMATIC DIE DEPT.
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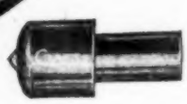
"Norton" Nib.



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Every Style of Holder. Secure Settings.

Diamonds Sent for Inspection.

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Tools for truing **Large, Coarse** and **Hard Emery, Corundum, Carborundum, Alundum, Crystolon** or other abrasive wheels will give the **greatest amount** of **service** with a **minimum** of **wear** on the **diamond.** Diamonds can be set in any style of holder desired. We've had a great many years' experience in the manufacture of Diamond tools and are thoroughly familiar with what is required of them.

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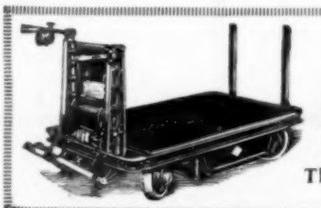

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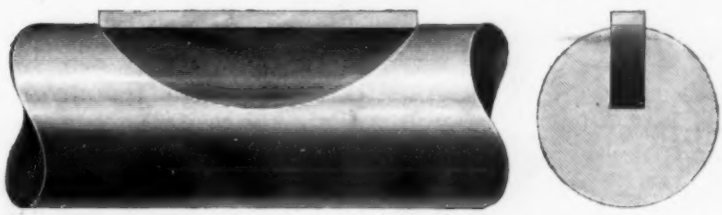
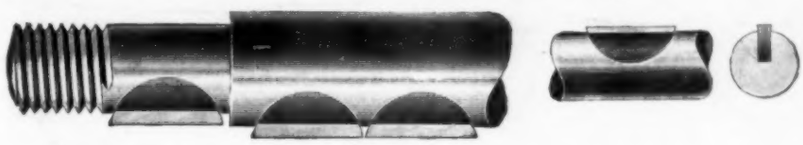


NO FITTING REQUIRED

If you are not already using this modern method of key-seating, don't delay but adopt it at once. Every day that you put off changing is costing you time and money. It is saving money constantly for others. Why not for you?



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All of our factory buildings are fire-proof. When you place your order with us you run no risk of having your production held up by a fire in our plant.

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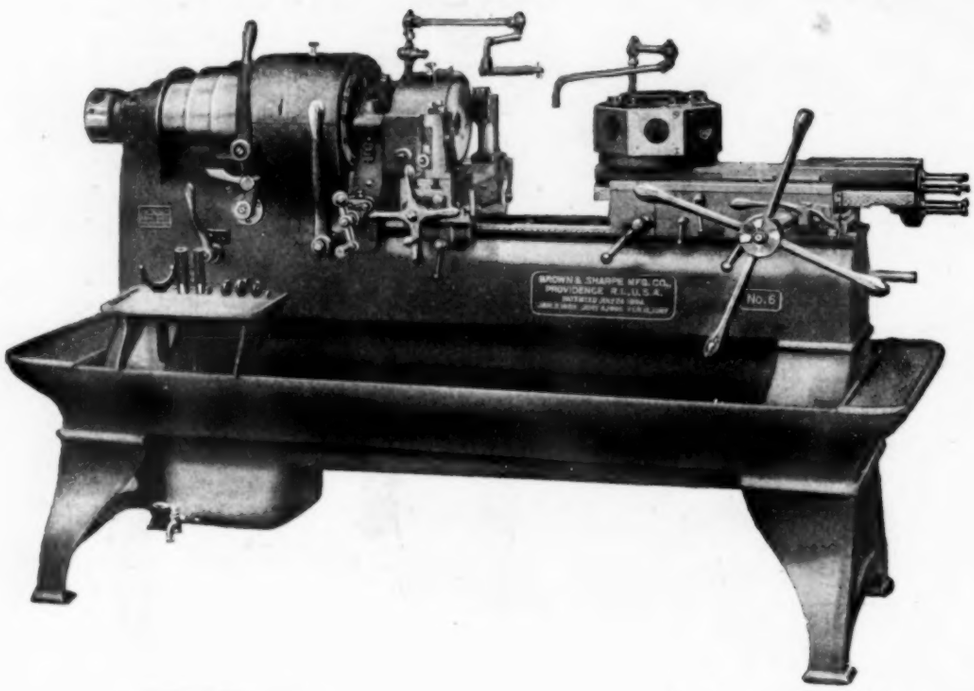
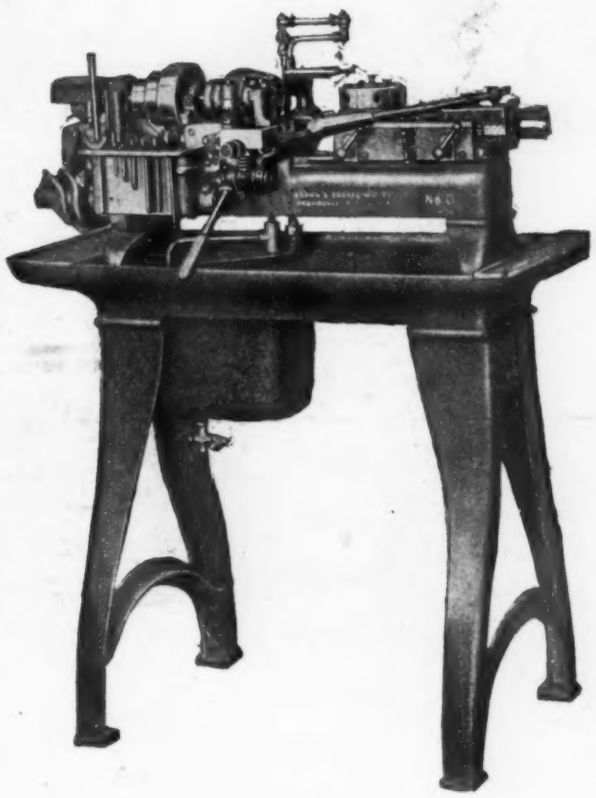


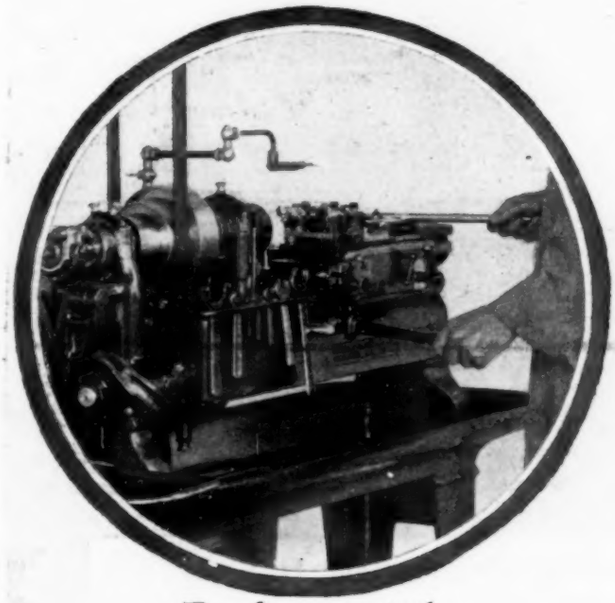
Three lever control

The larger machines, the Nos. 4 and 6, are controlled by three levers. The operator controls the turret tools by means of a pilot wheel with his right hand, while with his left he feeds the cross slide tools to the work. At the end of the operation, when the piece is cut off, by throwing the feed lever shown in the illustration, the next length of stock is instantly brought into position. Upon releasing the feed lever, the chuck closes firmly, securely holding the stock for the various operations.

Brown & Sharpe Mfg. Co.

Wire Feed Machines





Two lever control

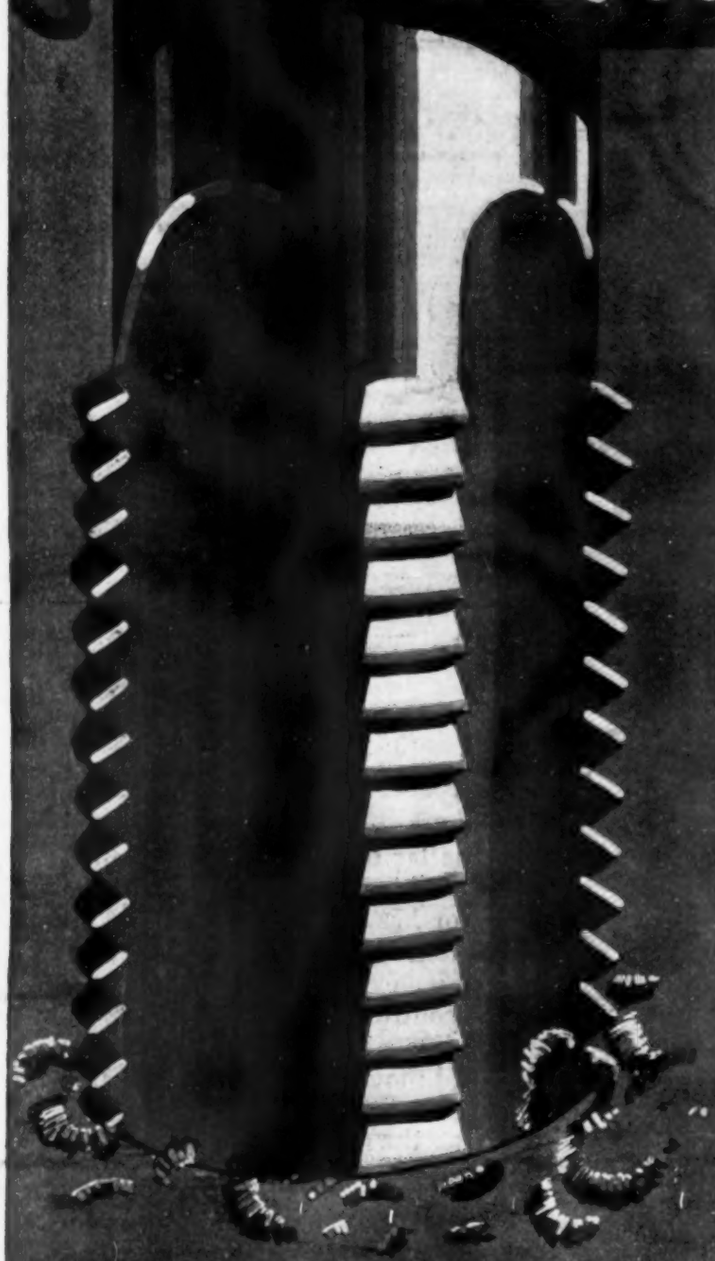
The ease and rapidity with which the smaller machines are controlled is particularly noteworthy. The operator has complete control of all operations by means of two levers. One advances the turret tools, the other controls the cross slide tools. When the piece is cut off, a slight forward movement of the cross slide automatically trips the feed clutch, bringing the next length of stock into position.

This largely eliminates lost motion, every lever being so located that a minimum amount of labor is involved in operating machine.

Send for Catalog **22-G.**

Providence, R. I., U. S. A.

BUTTERFIELD—



Why "Butterfield" Means Tool Economy

The deciding factor in tool economy is accuracy. The production of clean, accurate threads, and the exact reproduction thereof over a long period of manufacture, represent the biggest dividend on any tap investment.

Every process in the manufacture of Butterfield Tools is performed by experts, whose entire aim is to produce the highest quality. The rigid inspection prevents any possibility of inferior taps reaching the shipping room.

By the service afforded—by the ability to cut clean and accurate threads and to duplicate those threads over a long period of use—Butterfield Quality gives the maximum return on your tap investment.

Catalog No. 16 describes the complete line of Butterfield Taps, Reamers, Dies, etc.

BUTTERFIELD & COMPANY, Derby Line, Vermont, U. S. A.

Division Union Twist Drill Company

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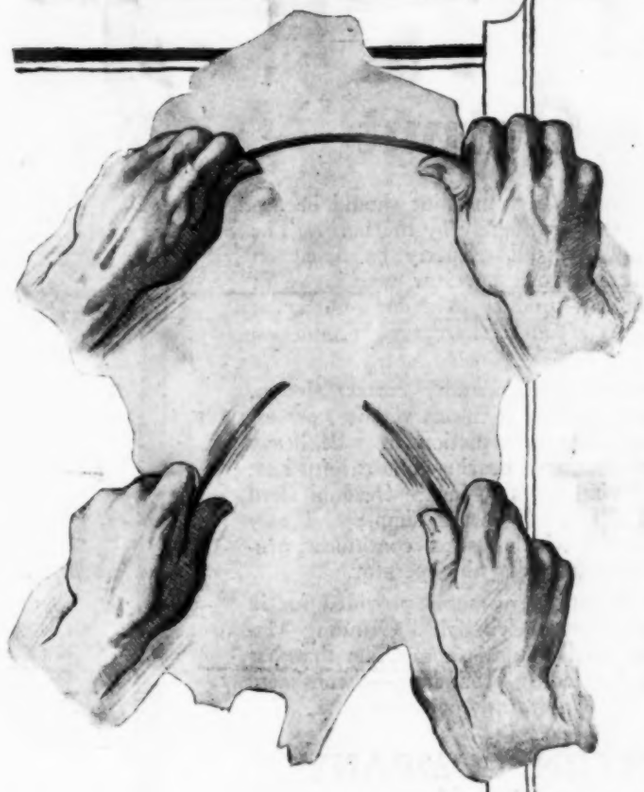

broken blades are not always poor blades.

Often it's a case of a good saw used in the wrong way. A hack saw may be brittle as glass or flexible as a watch spring, according to the temper of steel, but the temper is only one of the things that go to make good blades.

Starrett Hack Saws are tempered, milled and selected according to the work they are designed to do. That's why they "cut quicker and last longer."

According to the Starrett system of blade selection, there's a saw for every metal. Many saws will cut more than one metal, but no single blade will cut all metals, or even all shapes of the same metal economically.

Starrett Hack Saws plus the Starrett Hack Saw Chart make it easier to cut metal economically. Ask for a copy of Chart "C"—and "Hack Saws and Their Use"—both are free.

THE
L. S. STARRETT COMPANY
The World's Greatest Toolmakers
Mfrs. of Hack Saws Unexcelled
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42-64

Starrett Hack Saws

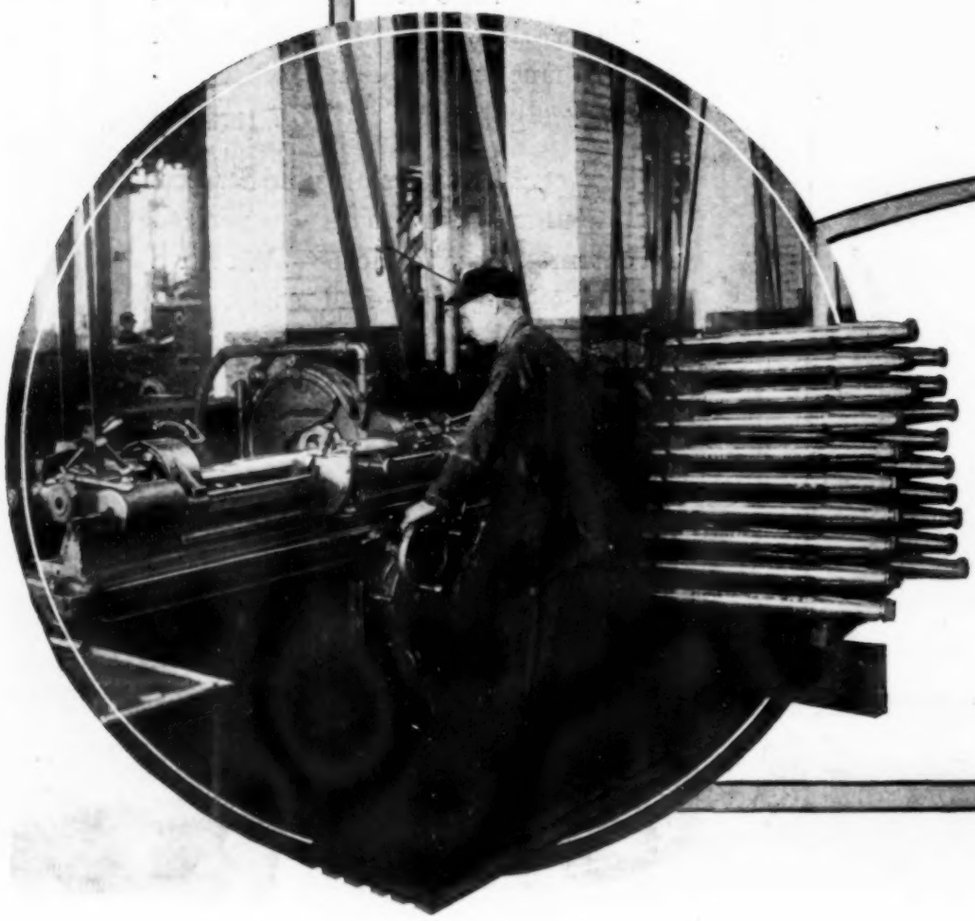
Machine Output—

The performance of a machine should be figured by the year, not merely by the hour. The expected output should properly be based on what the average good operator working with normal effort can produce in a day—not what an expert can do on a short time production "stunt."

This involves fundamentally correct design. In a grinding machine it means rigidity, power, sturdy wheel slide construction to take heavy cuts; well proportioned bearings and careful heat treatment of vital parts to insure freedom from trouble and delay. It means simple and easy operating control which assures continuous production without fatiguing the operator.

All these factors were amply provided for in the design of Norton Cylindrical Grinding Machines. The final result is a machine that has revolutionized grinding production—a consistent rapid producer of uniformly accurate work.

NORTON COMPANY
Worcester, Mass.

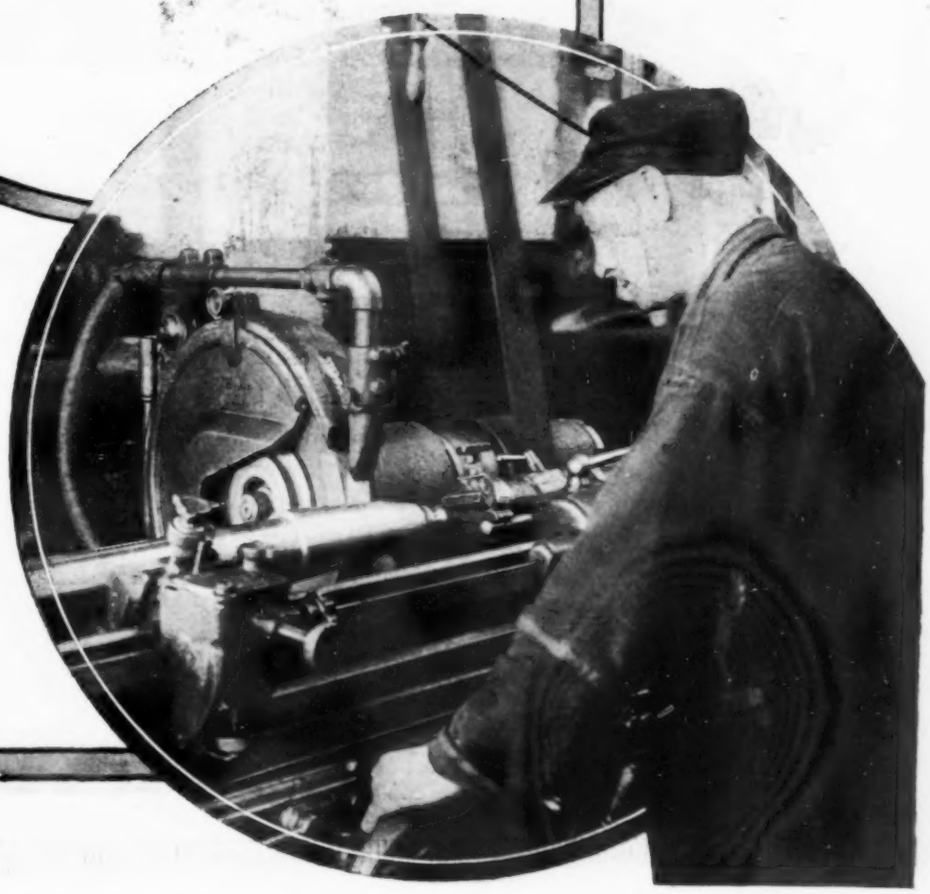


Wheel Service

The service one gets from a grinding wheel is primarily a matter of character and quality in the abrasive and bond, and skill and care in manufacturing. Next in importance is intelligent wheel selection. It has been said that a good operator can get results from almost any wheel within reasonable range. While to a certain extent this is true, it none the less pays to use the grain and grade which demonstration or experience has proved most efficient for a given condition. Finally, the treatment of a wheel by the user is of utmost importance. Careful handling, proper mounting, and timely dressing and truing of the wheel are essential. Attention to the combination of work speed and table traverse is likewise necessary to good results.

Users of Alundum and Crystolon wheels may secure maximum service in all respects. The correct wheel is always available, extensive records of practical results are at a customer's service through our Sales Engineering Department, and expert instruction in the care and use of wheels can be had from our technically trained salesmen and demonstrators.

NORTON COMPANY
Worcester, Mass.



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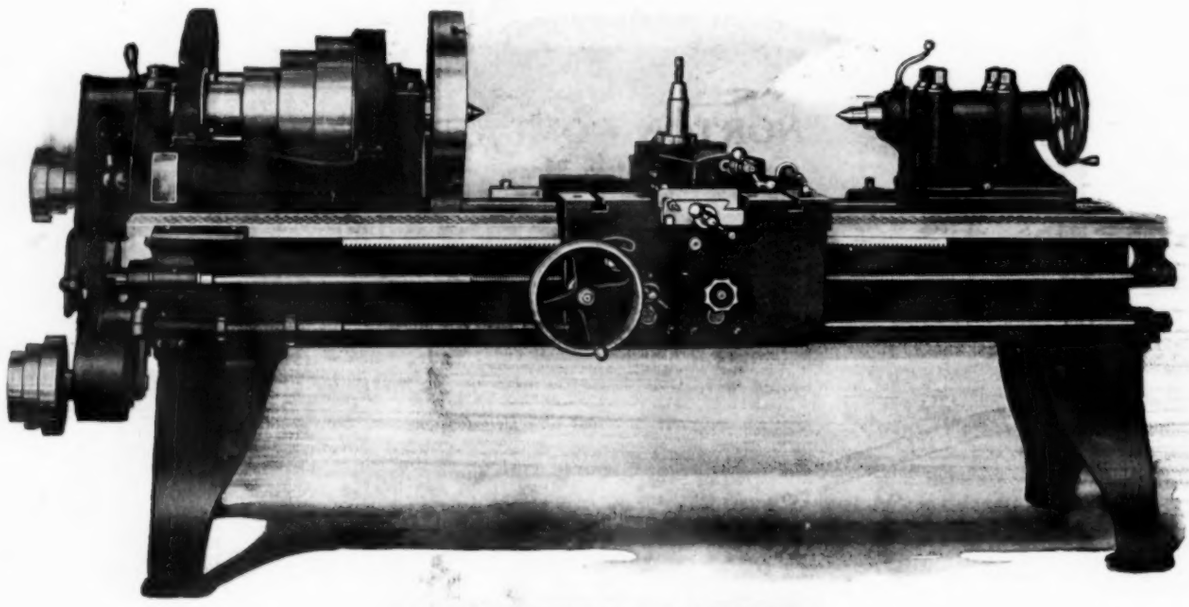

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BELT AND GEAR FEED

REED-PRENTICE COMPANY

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THERE ARE FEW SALES ARGUMENTS TO ADVANCE ON "REED" LATHES THAT MIGHT NOT APPLY EQUALLY TO OTHER EXCEPTIONALLY GOOD LATHES—BUT IT MAY BE NOTED THAT THEIR SPLENDID ACCURACY AND CONSISTENT LONG-LIFE HAVE MADE THEM MUCH SOUGHT AFTER BY THE MOST REPUTABLE FIRMS HERE AND ABROAD.

QUITE A NUMBER OF MINOR DETAILS ON A "REED" LATHE ADD MATERIALLY TO ITS EARNING CAPACITY IN YOUR SHOP.

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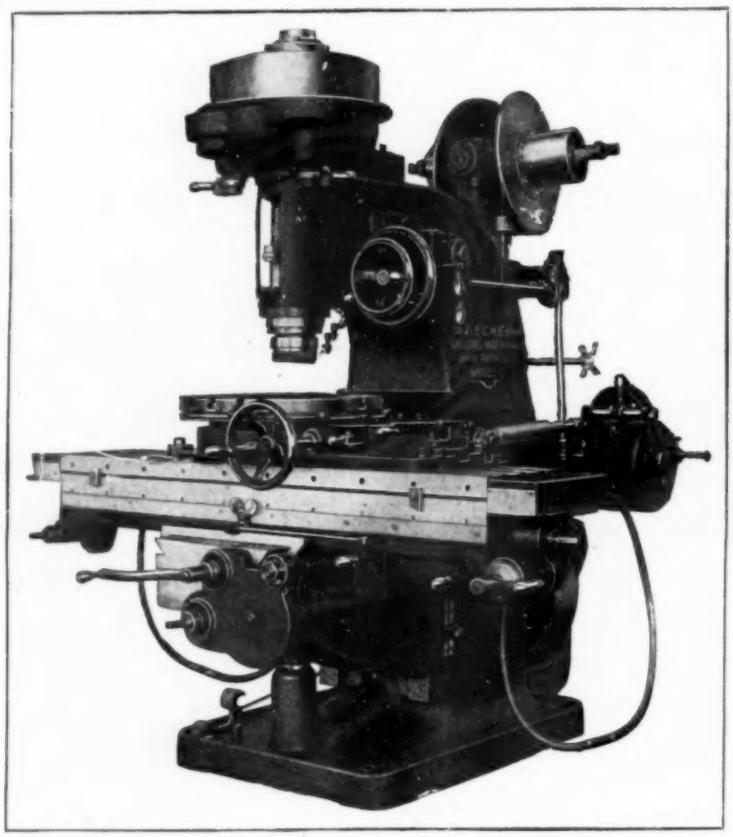

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Power is the characteristic that appeals to the operator, whether he manipulates a boring machine or a motor car.

He likes his machine to "take it on high," whether it be a deep milling cut or a stiff mountain grade.

The LANDIS is a superior Boring Machine because it has a powerful and exclusive concentric screw spindle, because it responds to heavy-duty requirements wherever installed.

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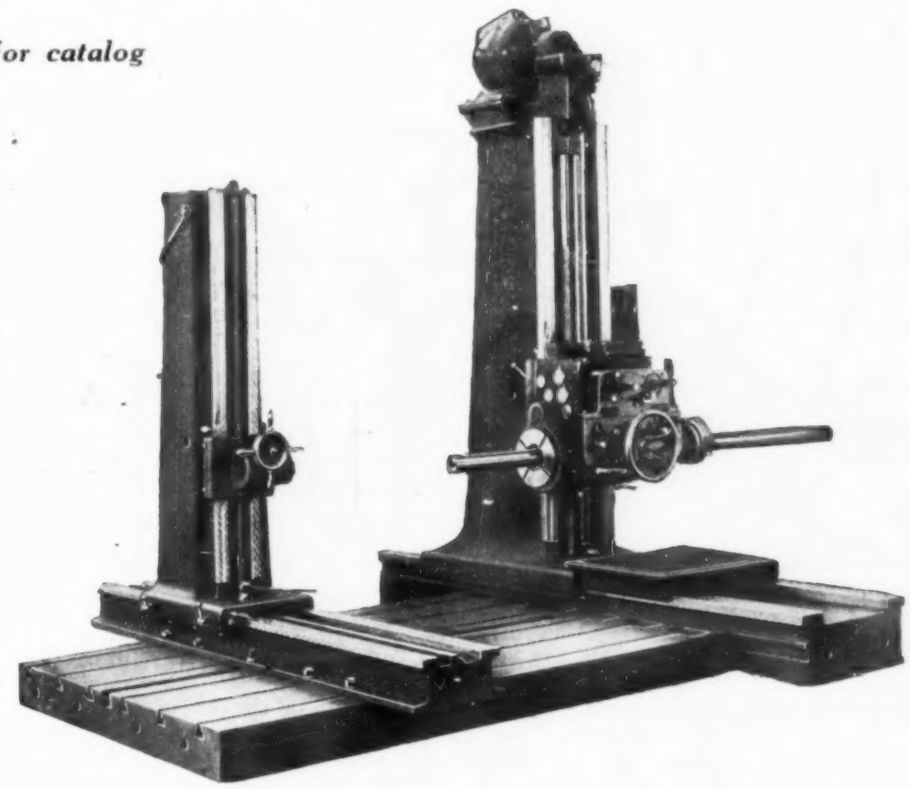

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We make Slocomb Center Drills in sizes for all requirements and in standard and special angles of countersink. Made of High Speed Steel and a Tungsten Alloy that we call Semi-High Speed Steel.

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Gale-Sawyer make good Reamers—"Blanchard" helps

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Only the best is good enough in the manufacture of Gale-Sawyer Adjustable Reamers, so a Blanchard No. 10 High Power Vertical Surface Grinder was selected to grind the surfaces of their high speed steel adjustable reamer blades.

These blades, of hardened high speed steel, 3-in. long, ¾-in. wide, are ⅜-in. thick at the back and ¼-in. at the front. The total tolerance is .00025-in., which necessitates very careful placing of the blades in the fixture used to obtain the required taper. 112 blades per hour, ground both sides, is the output. If the blades were flat, and laid directly on the chuck, this output would be easily doubled.

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Your tools will cost less if you have a Blanchard in your toolroom.

The Blanchard Machine Co.
64 State Street, Cambridge, Mass., U. S. A.

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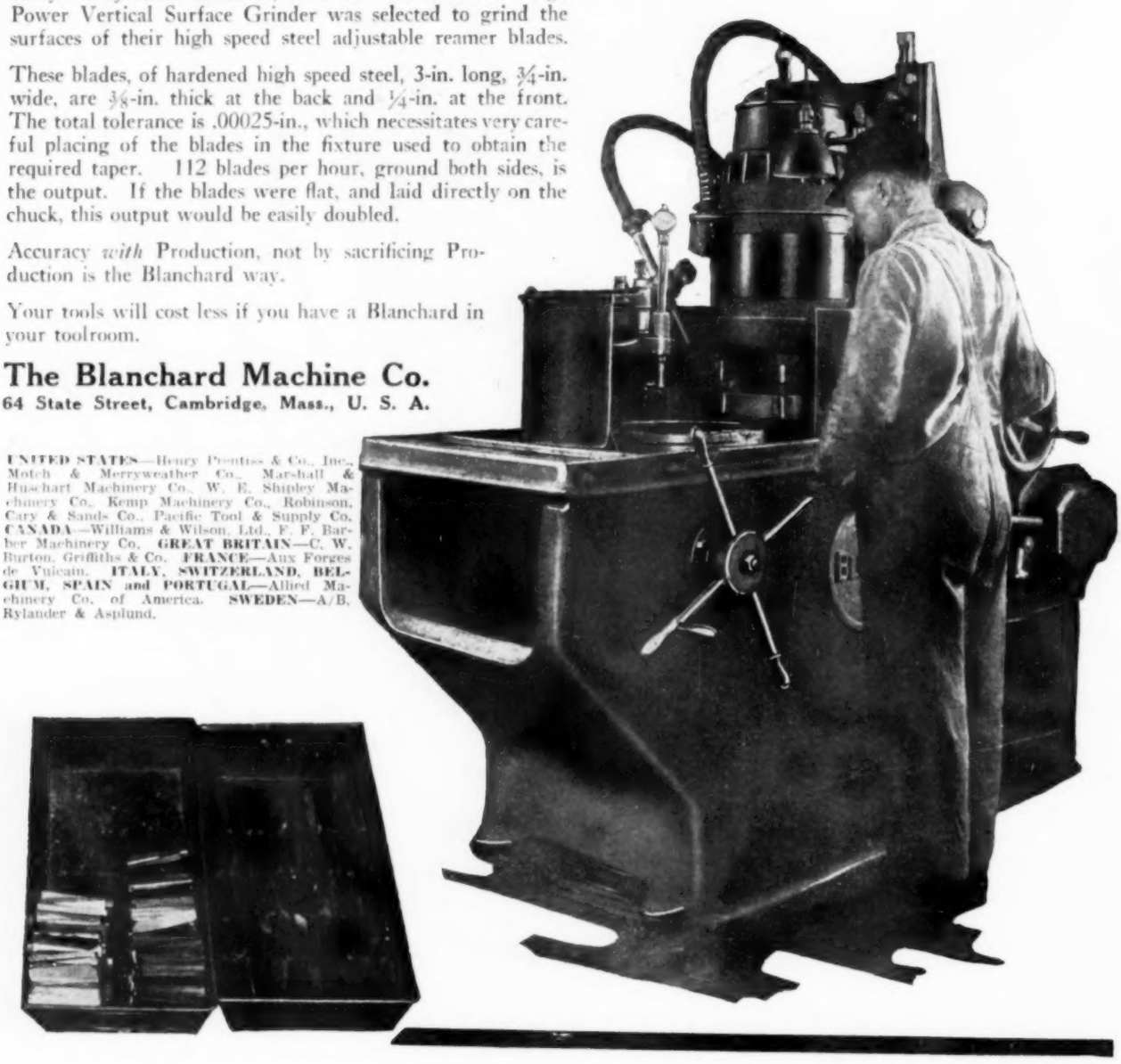

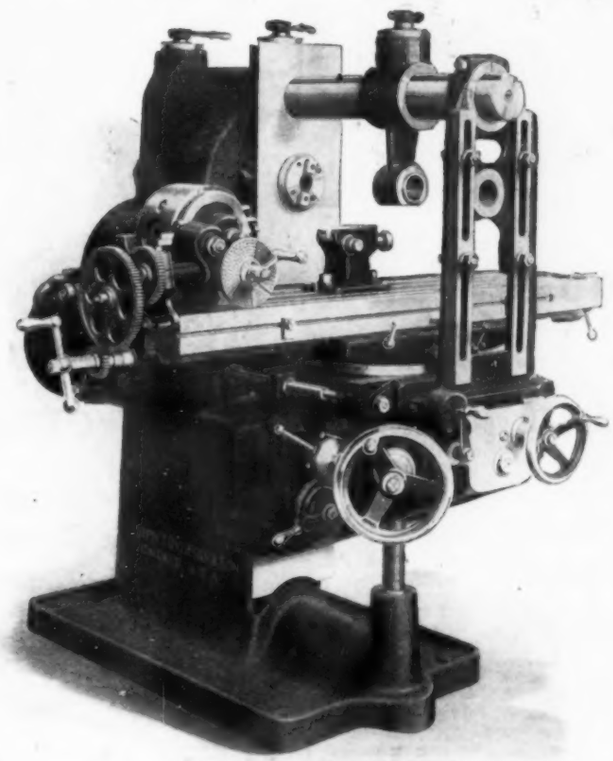

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The Ryerson-Conradson Milling Machines embody features of design which make them particularly suitable for modern shops where speed, accuracy and strength are required. A few of the most prominent features of this miller are: The herringbone gear drive to spindle; elimination of all clutches in the forward as well as the reverse spindle drive; one lever controlling forward and reverse rapid traverse and feed of table, saddle and knee, and a noticeable reduction of the many levers required for spindle and feed changes, as found in standard millers.

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$7.20 for Fuel Oil	$3.35 for Illuminating Gas
1.10 for Natural Gas	1.00 for Bituminous Coal
1.55 for Producer Gas	3.70 for Anthracite Coal

$6.50 for Electric Current

Do you realize that the average Thermal efficiency of industrial furnaces operated on:

Fuel Oil	Is	10%	Illuminating Gas	Is	30%
Natural Gas	Is	30%	Bituminous Coal	Is	25%
Producer Gas	Is	30%	Anthracite Coal	Is	10%

Electric Current Is 60%

INDUSTRIAL CORPO

10-POST OFFICE SQUARE

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But you must figure further of course

Think of the endless number of factors entering into the problem of getting adequate returns from furnace installations; from the installation of furnace auxiliary apparatus; from the general plan of placing your equipment in your plant; and from the operating system and work as a whole. Accumulated information of this nature is available to you. Whether your industrial furnace problem is a co-ordinated plant proposition or an individual equipment enigma, the Industrial Furnace Corporation is organized to solve it for you.

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THIS BALL MUST BE WITHIN A HALF THOUSANDTH OF AN INCH AND HAVE A DEFINITE LOCATION WITH REFERENCE TO MAIN BODY

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This would be a case of next-to-impossible if it was not for the No. 205 Grinder.

The part ground is the ball which must be truly spherical, to size within one half thousandths of an inch, and have a definite location with reference to the hole through the main body of the piece. You can appreciate what an accurate grinder is required to machine the bal' within limits necessary.

The Rivett, equipped with suitable chucking devices grinds these balls at a surprising rate.

Of course you are interested if you are interested at all in accurate work.

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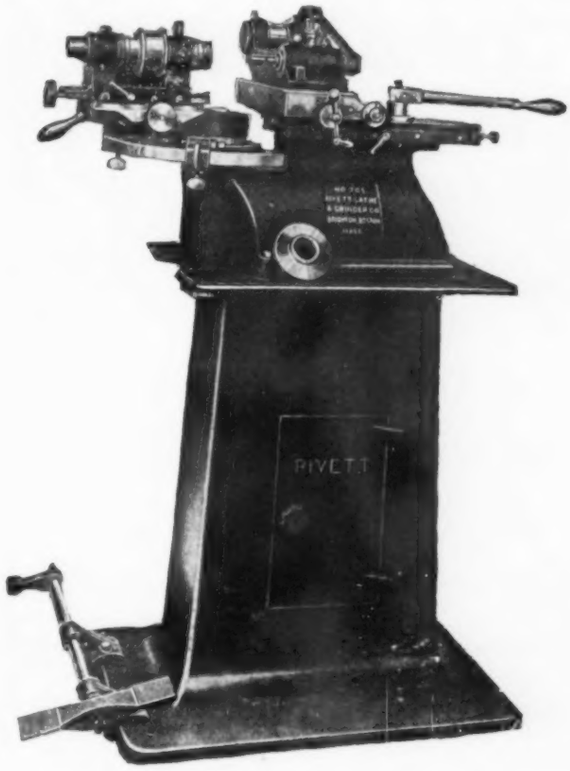

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We carry a full line of the Rivett Lathe and Grinder Company's machine tools. We specialize in machine shop equipment and accessories.

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We stock a complete line of High Grade Machine Tools including Rivett Machines, Attachments and Accessories.

The Cleveland Tool & Supply Co.

PHILADELPHIA, PA.

Exclusive representatives for Cleveland Boring Mills, Open Side Planers and Milling Machines.

We carry a complete stock of Rivet Lathes, Grinders and Attachments.

Quick deliveries.

D. Nast Machinery Co.

Rivett Lathe and Grinder Company, Brig[illegible]

NEW YORK, NEW YORK

We are agents for the Champion Tool Works, Lathes, Mulliner Tool Room Lathes. We carry a stock of Rivett Machines, Attachments and Accessories.

Patterson, Gottfried & Hunter, Inc.

DETROIT, MICHIGAN

At 997 Woodward Ave. we maintain a showroom for the display of metal working machinery in general and particularly we carry a stock of Rivett Machines, Attachments and Accessories.

J. R. Stone Tool & Supply Co.

TORONTO, CANADA

We represent in Canada the leading manufacturers of High Grade Machine Tools. We carry a stock of Rivett Machines, Attachments and Accessories.

H. W. Petrie, Limited

STOCKHOLM, SWEDEN

High grade machine tools and machine shop equipment our specialty. A full line of Rivett Lathes and Grinders, Attachments and Accessories always in stock.

A. B. Galco, Ltd.

HARTFORD, CONN.

We sold $150,000 worth of Rivett Products during the past year.

We are distributors, too, for Monarch Engine Lathes, Ohio Planers and Shapers, Abrasive Surface Grinders.

Purinton & Smith

ROCHESTER, N. Y.
ALBANY, SYRACUSE, BUFFALO

We are agents for Hamilton Engine Lathes, G. A. Gray Co. Planers, Kempsmith Milling Machines, Fosdick Radial Drills. In addition to the above we carry a stock of Rivett Machines, Attachments and Accessories.

Homer Strong

FRANCE, BELGIUM, ITALY
SPAIN and PORTUGAL

We carry a full line of Rivett Lathe and Grinder Company's Machine Tools and Attachments, and offer you our services in their connection.

Fenwick Freres & Co.
Paris, France

PITTSBURGH, PA.

Bradford Lathes, Fosdick Radials, Kempsmith Millers and a score of others go to make up our big line of quality tools.

The Rivett Line is one of our latest and best acquisitions. Our stock is open for your inspection.

Somers, Fitler & Todd Co.

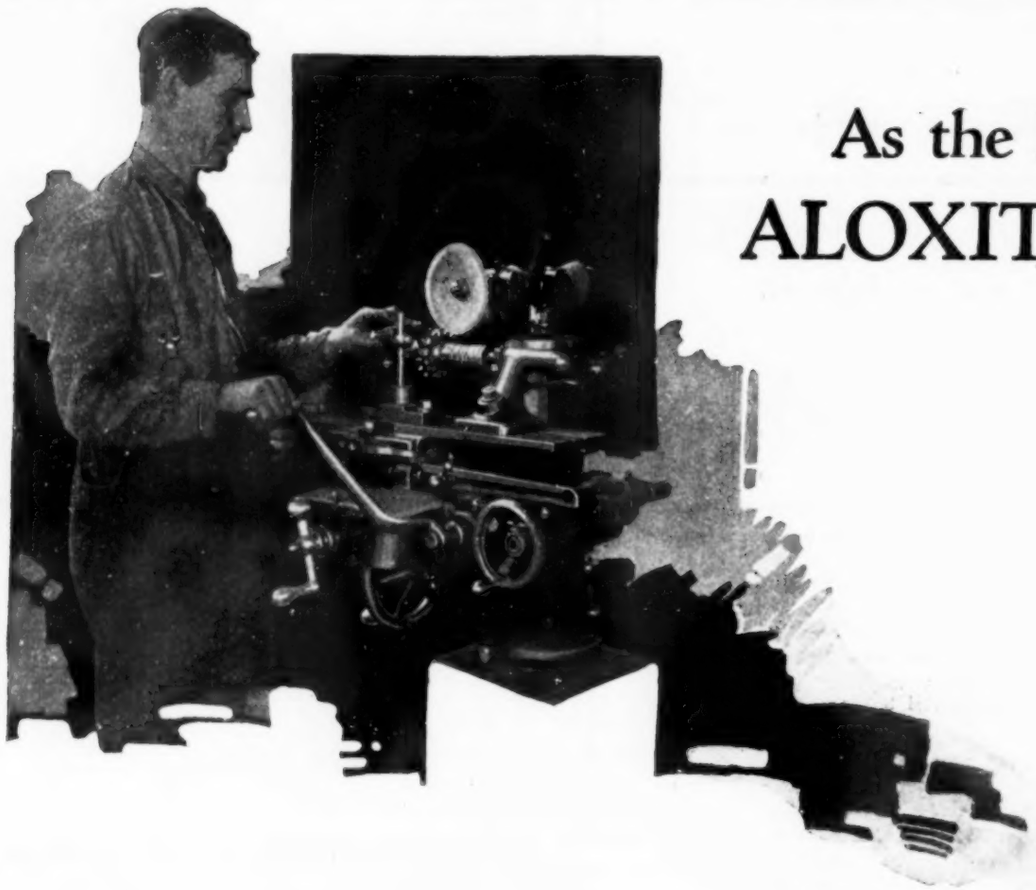
Rivett Service Stations—exactly! Just as the automobile user makes use of the Automobile Service Station so the user of the Rivett Lathe or Grinder takes advantage of the Rivett Service Stations.

Look over this list. Every Service Station on these pages can give you information and instructions regarding the particulars of Rivett Precision Lathe and Rivett Internal and Radial Grinders; can demonstrate to you the high efficiency of Rivett products and can offer anything in the line of Rivett accessories and supplies.

Select the Service Station nearest you—and learn the latest news on Rivett Quality Products.

hton District of Boston

You Have Never Had a



As the New ALOXITE AA

THE success of the new Aloxite AA Wheel is nothing short of astonishing.

It is in a sense making grinding history.

For years you have been looking for just such a wheel to grind reamers, cutters, hob mills and general tool room work—for surfacing high speed steel for die work and for internal grinding on steel. You have wanted a wheel that was so open and

THE CARBORUNDUM COMPANY

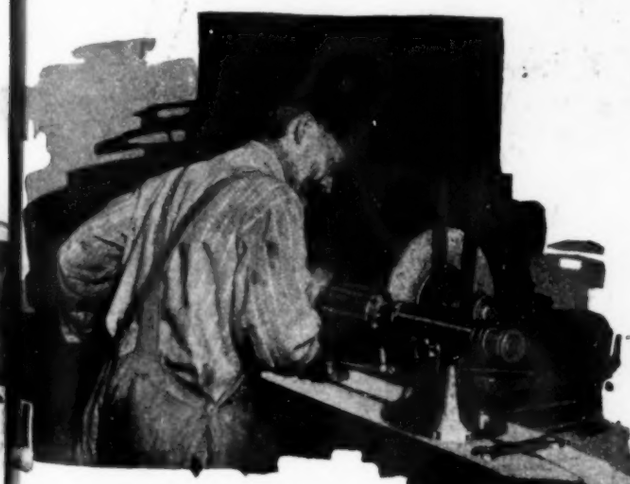
NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND DETROIT CINCINNATI

Wheel that Cut So Fast

porous in its structure that it would cut cool, clean, free and fast—that would keep on cutting that way, freeing itself and keeping sharp with practically no dressing, because of its sharp, tough, remarkably large crystals.

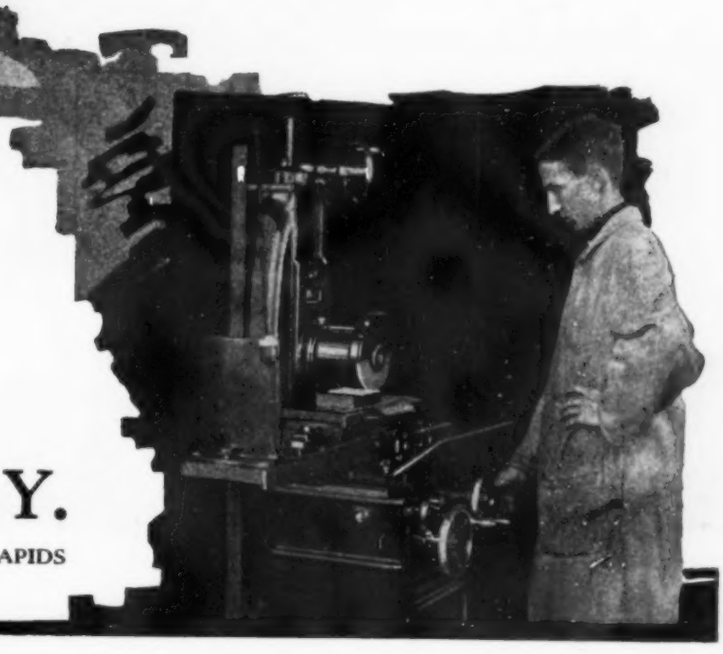
Tests have proved that the Aloxite AA Wheel has every one of these qualities.

And many a time you have wanted a wheel that would take off heavy cuts without burning.



This Aloxite AA Wheel Took a Cut of .035

A 36 grit T grade Aloxite AA Wheel, in a test on hardened steel dies, started in with a cut of .005, then gradually increased to .020



finally taking a cut of .035. Give Aloxite AA a test in your tool room. You will find that you have never had a wheel that cuts so fast, so free, so cool.

NIAGARA FALLS, N. Y.

PITTSBURGH MILWAUKEE GRAND RAPIDS

Here, Gentlemen are

Lapointe

cuts accomplished-

Speedily and Economically!

To broach is to accomplish internal cutting with speed. To broach by Lapointe of Hudson methods is to accomplish internal cutting with more speed.

Since we are the originators of commercial broaching we hold certain patent rights which give our machine unusual speed in "pull" and "return."

If you have to cut splines, keyways, internal gear teeth, spirals, round or square holes, oil grooves, or any irregular or odd forms either straight or taper, you may as well do it by the fastest method—The Lapointe of Hudson method of broaching.

In the matter of economy in broaching, Lapointe of Hudson methods stand as unusual.

Lapointe of Hudson broaching machines are constructed on the principle that the highest possible quality is the less expensive in the long run.

Therefore every part that goes into a Lapointe of Hudson machine is a quality part.

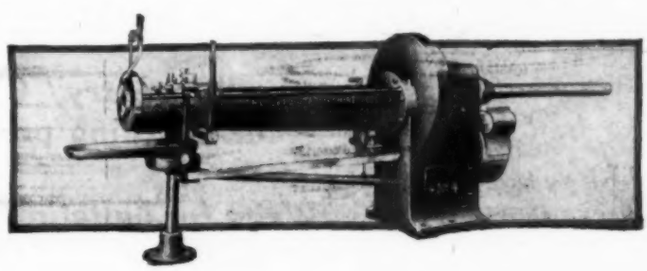
For example, the draw screw, driving shafts, etc., are made of the highest grade of nickel steel so that they will stand up well under the most severe strains. The draw nut is of the best quality of phosphor bronze while the gears, broaches, etc., are of special steel tempered and hardened in our own heat treating department. This high quality reduces upkeep costs, which means economy.

Lapointe Machine Tool Company

Hudson, Mass., U. S. A.

Originators in Commercial Broaching

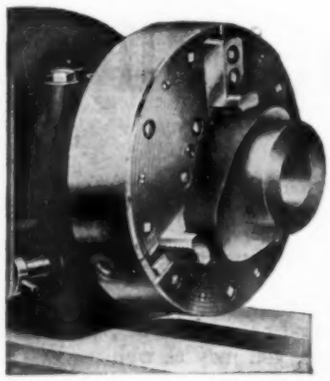
Burton Griffiths & Co., Ltd., British Isles; Allied Machinery Co., South America, Russia and Balkan States, Belgium, Holland, Switzerland, Austria, New Zealand, and Tasmania; Alfred Herbert, Ltd., France, Italy, Spain, Portugal and Japan; V. Lowener, Scandinavia; F. G. Kretschner & Co., Germany and Austria.



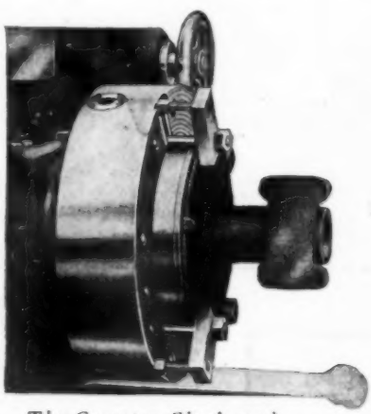
r Hudson

The "Coventry" Chuck

Below are shown one Standard and one Special application of the "Coventry Chuck"



Standard reversible jaws set for gripping irregular or eccentric work. The gas engine cam is made from a mild steel stamping with 3-inch hole drilled into solid metal. The chuck is our 15-inch size. After the jaws have been properly set, work like this is gripped and chucked as easily as any circular object and much quicker than if a four-jaw chuck were used.



The Coventry Chuck used as a face plate fixture, the object in this instance being clamped back on a locating ring, and a stem fitting into the bore of the chuck. The clamps are held from the T slots in the jaw slides. The chuck here is used for a second operation on the part shown at the left. Use of the chuck in this way saves the trouble and time of taking it off and putting on a special face plate fixture.

Adaptability

In addition to being exceptionally strong, the "Coventry" Concentric Chuck is also adaptable to a large variety of special work which is outside the scope of standard self-centering chuck. The exceptionally long bearing surfaces of the jaw slides permit the use of a wide range of special jaws.

These can readily be made by the user, no expensive scroll cutting apparatus being required; the only special tool necessary is a hob, which we carry in stock. The standard soft jaws can be shaped to suit irregular work, thus frequently saving the cost of special fixtures.

Let the "Coventry" Chuck solve your chucking problems.

Write for bulletin No. 208.

Made in 6 Sizes: 9 in., 12 in., 15 in., 18 in., 21 in. and 25 in. diameter.

ALFRED HERBERT, Limited

54 Dey Street, New York **31 Yonge Street, Toronto**

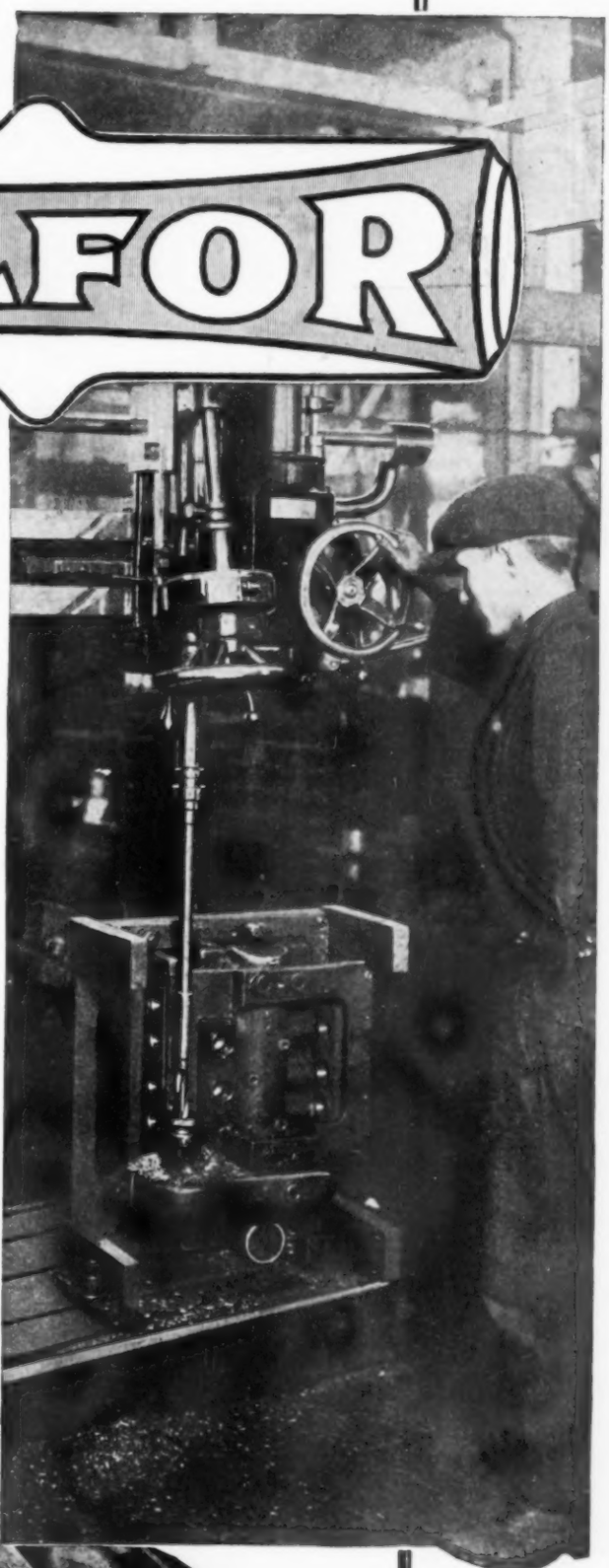
Head Office and Works: Coventry, England

Other Branches and Associated Companies

Sole Agents in the United States and Canada for the products of L. Gardner & Sons, Ltd., Patricroft, Manchester, England; H. W. Kearns & Co., Ltd., Broadheath, England; Wm. Muir & Co., Ltd., Manchester, England; Joseph Petermann, Moutier, Switzerland; John Stirk & Sons, Ltd., Halifax, England; Webster & Bennett, Coventry, England.

"Celfor" is taken from the Latin, "celeritas"—speed and "fortis"—strength. We have combined the two in the naming of our drills, for it is symbolic of the qualities with which they are endowed.

CELFOR



When Quality is Vital

When drills are called upon to keep up a heavy rate of production, day in, day out the year around, there will come a time when the monotonous daily grind will commence to show itself in wear.

It is then that drills must either be replaced, salvaged or put on some other job.

It is in conditions like these that the quality of Celfor Drills shows itself. They will *wear*. They will *outwear* the average, for their grain is intact, and not disturbed by milling—the flutes are twisted into them at white heat.

Throughout the entire manufacturing process, Celfor Drills are handled with the greatest care. Each stage of the work is inspected; each batch of steel, which goes to make them, is carefully tested.

In order to *get* quality, you must *put in* quality.

In order to *get* strength, you must *put in* strength.

Such are the standards of Celfor.

CLARK EQUIPMENT CO.
Buchanan, Mich.

Montreal, Rudel-Belnap Machinery Co.; Toronto, Rudel-Belnap Machinery Co.; Amsterdam, U. S. Trading Corp.; Buenos Aires, Marden, Orth & Hastings Co.; Calcutta, Tapper & Selikowitz; Christiania, John M. Larsen; Copenhagen, John M. Larsen; Gothenberg, John M. Larsen; Stockholm, John M. Larsen; London, Coates Machinery Tool Co.; Milan, Weiss & Stabilini; Tokyo, Andrews & George; Paris, Moerch & Roumet.

Do You Need a Furnace in a Hurry?

We have 150 furnaces in stock for immediate shipment

Tool Hardening Furnaces

Case Hardening Furnaces

Re-heating Furnaces

Lead Hardening Furnaces

Cyanide Furnaces

Oil Tempering Furnaces

Forge Furnaces

Melting Furnaces

Equipped with either gas, oil or combination burners

Write, wire or phone us

Advance Furnace and Engineering Co.

Warehouse Street, Springfield, Mass.

The Right Drill is the POINT

Fastfeed Drills, Cutters and Reamers are the right drills.

They have that inborn ability, the resisting stamina which keeps them going while they cut through the toughest metal at a speed which would shatter the average drill.

They will bolster up the production of any shop. Use Fastfeed for production's sake.

Our catalog describes our entire line.

Send for a copy

Fastfeed Drill & Tool Corporation
Toledo, Ohio
New York Office, 21 Murray St.

VENUS PENCILS

The largest selling Quality pencil in the world

Each VENUS PENCIL is a work of art; its lead smooth, firm, non-crumbling; its grading absolutely exact; unsurpassed for any purpose. Demanded by engineers everywhere who must work with tools dependable.

17 black degrees, 3 copying

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Plain Ends, per doz., $1.00
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At stationers and stores throughout the world

American Lead Pencil Co.

227 Fifth Avenue, New York

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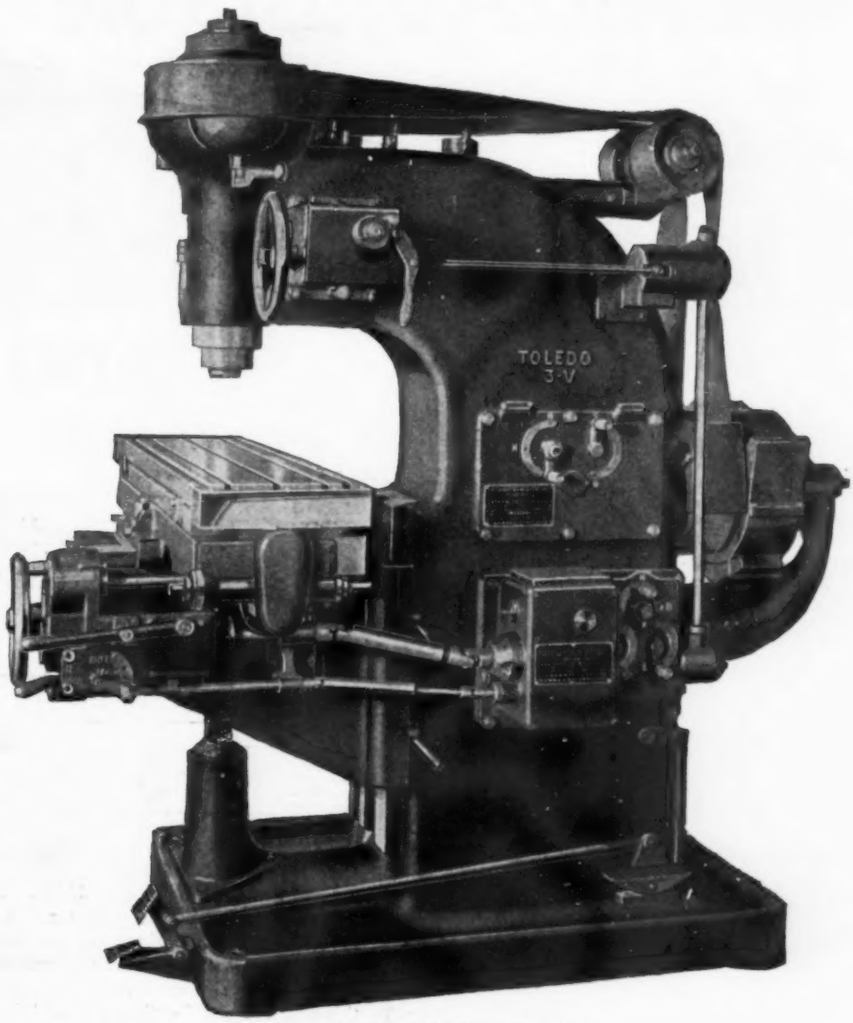
All Feeds Engaged and Reversed by One Lever



Toledo Vertical Milling Machine

All controls are within a 2-foot circle.

Movements of the knee, saddle and table are all controlled from one operating position, and the feed mechanism is so designed that it is absolutely impossible to engage any two power feeds at the same time. Therefore, even an inexperienced operator cannot possibly damage the machine or the work.

When the quick traverse handle at the front of the knee is engaged, all regular feeds are automatically disengaged, and when it is brought back to the regular position, regular feeds are automatically engaged, without touching any other lever but the quick traverse lever.

These are advantages enough to make the Toledo a leader. But there are other points of superiority, such as unit construction, a new method of mounting the knee, extra support to table, foot-treadle for starting and stopping, and twenty-nine ball bearings throughout the machine. For tool-making and die-sinking, it is incomparably efficient.

Make your next order for a milling machine read

THE TOLEDO MILLING MACHINE CO., Toledo, Ohio

TOLEDO

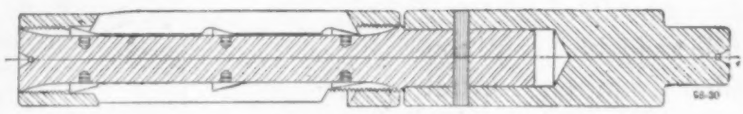
Martell Adjustable

Hand Reamer

The most accurate and quickly adjusted hand reamer. One pair blades at right-angle and two pairs at left-hand angle to the center line.

Particularly designed to ream holes where maintenance of accuracy is essential. Fitted with micrometer attachment for adjustment purposes to bring back the 0.0001, 0.0002 or 0.0003 lost in size from wear without regrinding.

Eliminates Chatter and Cuts a More Nearly Perfect Round or Straight Hole.



Cross-section of Adjustable Hand Reamer. Note that three supporting wedges are used under each blade. The reamer blade is finished so that it balances on the middle wedge and can only be seated on the end wedges by drawing up the clamping nut firmly. The blades are ground in this position, so that when the pressure is released, as when taking them out, they are actually concave instead of straight. By clamping the blades in this strained position they are held firmly throughout their entire length and the cutting edge held perfectly straight.

Martell Hand Reamer—Disassembled

THE TAFT-PEIRCE MFG. COMPANY

WOONSOCKET RHODE ISLAND, U.S.A.

New York: Woolworth Building Chicago: First National Bank Building Detroit: Majestic Building

TAFT-PEIRCE PRODUCTS CARRIED IN STOCK BY Syracuse Supply Co., Syracuse, Buffalo, Rochester; Cadillac Tool Co., Detroit; Sherritt & Stoer Company, Philadelphia; Wm. M. Pattison Supply Co., Cleveland; Northern Machinery Co., Minneapolis; Mid-West Machine & Tool Supply Co., Davenport, Iowa.

ATKINS SILVER STEEL SAWS

E. C. ATKINS & CO. SAWS
The World Over
In every country and metropolis Atkins Metal Saws and Metal Cutting Machines are producing maximum results for their owners.
The Atkins family has been making saws and saw tools for over three hundred years and you can profit by the service built into them. Write for our catalog illustrating,
"A Perfect Saw for Every Purpose"
Finest on earth

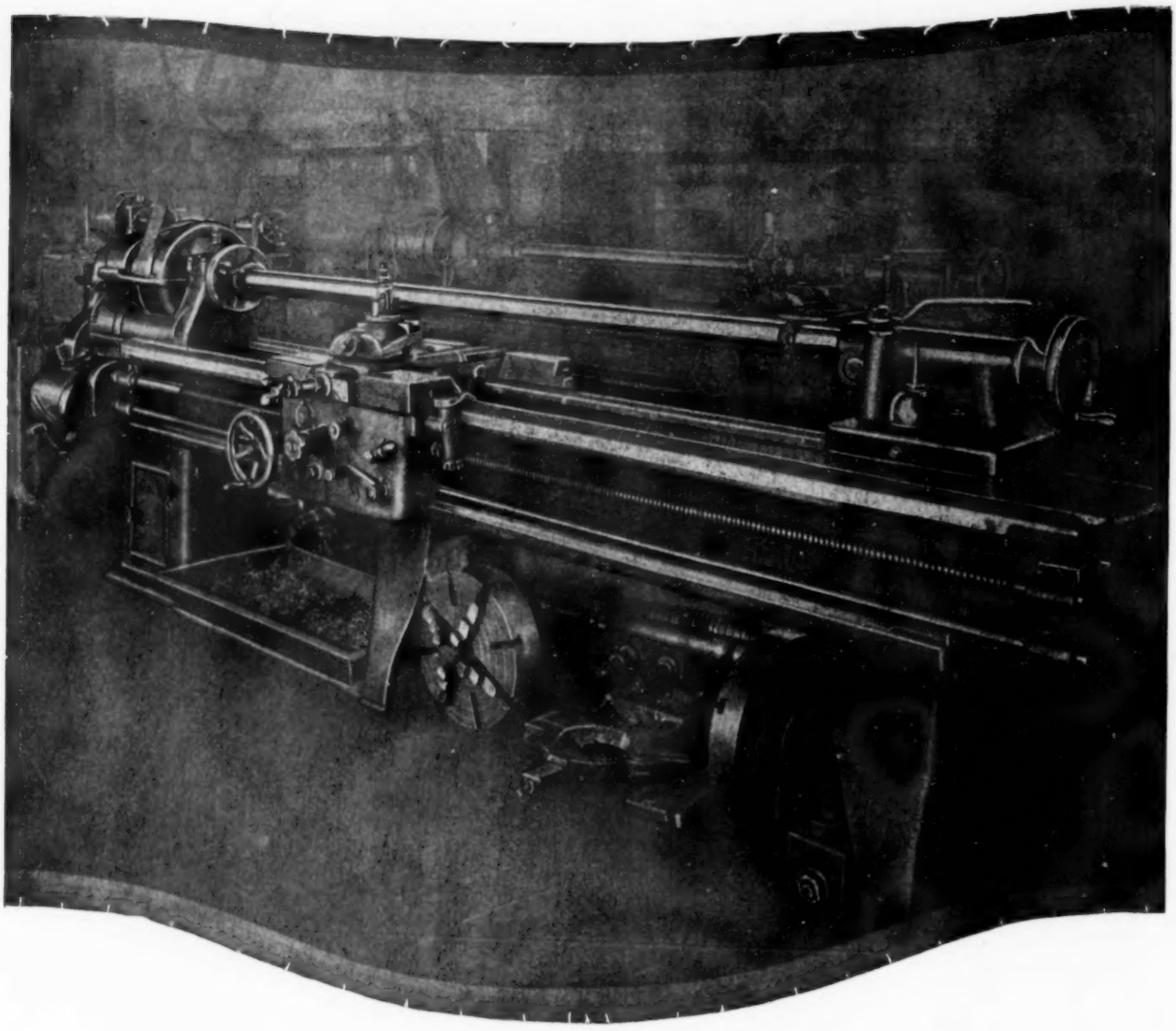
E. C. ATKINS & COMPANY, Inc.

"The Silver Steel Saw People" Home Office and Factory, Indianapolis, Indiana Established 1857

Canadian Factory, Hamilton, Ont. Machine Knife Factory, Lancaster, N. Y.

Branches carrying complete stocks in all large distributing centers as follows:

Atlanta, Chicago, Memphis, Minneapolis, New Orleans, New York City, Portland, Ore., San Francisco, Seattle, Vancouver, B. C., Sydney, N. S. W., Paris, France



You Can Rely On Sidney Rigidity

Sidney Lathes are rigid. You can depend upon their rigidity to give you absolutely accurate work despite the strains of bulky work or constant use.

The Sidney illustrated is doing precision work at the shops of The Pacific Marine Iron Works at Portland, Oregon. There are other similar Sidneys doing heavy, heart breaking work in the same yard.

There is a Sidney for every lathe need

The Sidney Machine Tool Company
Sidney, Ohio, U. S. A.

As Firm as the Rockies

Rigidity from base to column cap has been the primal idea around which the Mueller Radial Drill has been designed and constructed.

Especial attention has been devoted to the mechanical perfection of the column. It is absolutely rigid under every possible machining condition.

Four internal webs are so joined together as to practically form an I-beam construction. These positively prevent vibration and ably resist any tendency to spring under stress.

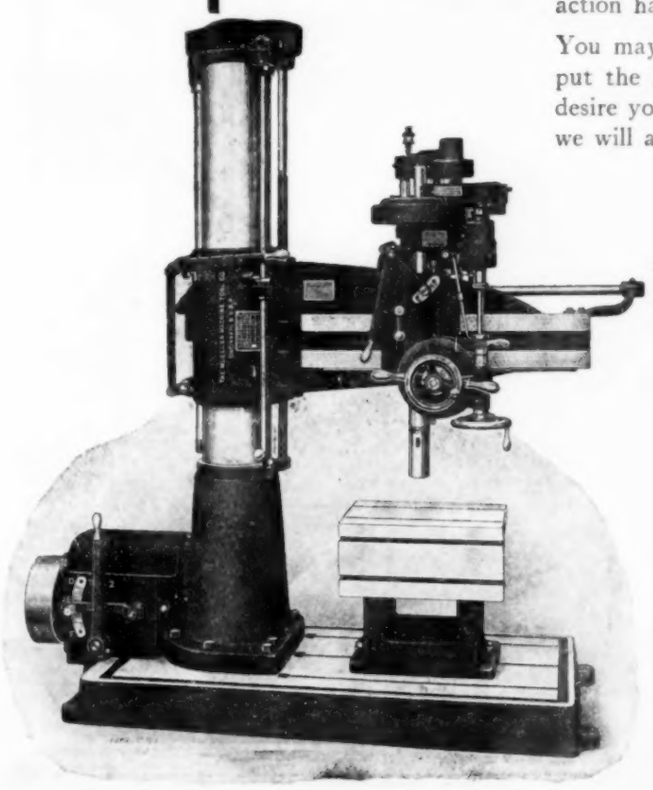
No matter the location of the arm —high or low—the rigidity never lessens. An extremely wide arm bearing surface further enhances stiffness.

The portion of the column on which the arm travels is ground to size.

MUELLER
Radial Drills

have established their reputation by reason of accurate operation during long years of service. Their action has amply fulfilled their designers' hopes.

You may think your work is of such severity as to put the Mueller to the test. This is just what we desire you to believe, because when we convince you we will add another Mueller booster to our list.



"Now is an opportune time to get acquainted with the manufacturers of the MUELLER Radial Drill."

The Mueller Machine Tool Co.

Manufacturers of Radial Drills and Lathes

Cincinnati, Ohio

Established 1902

NATIONAL CLEVELAND

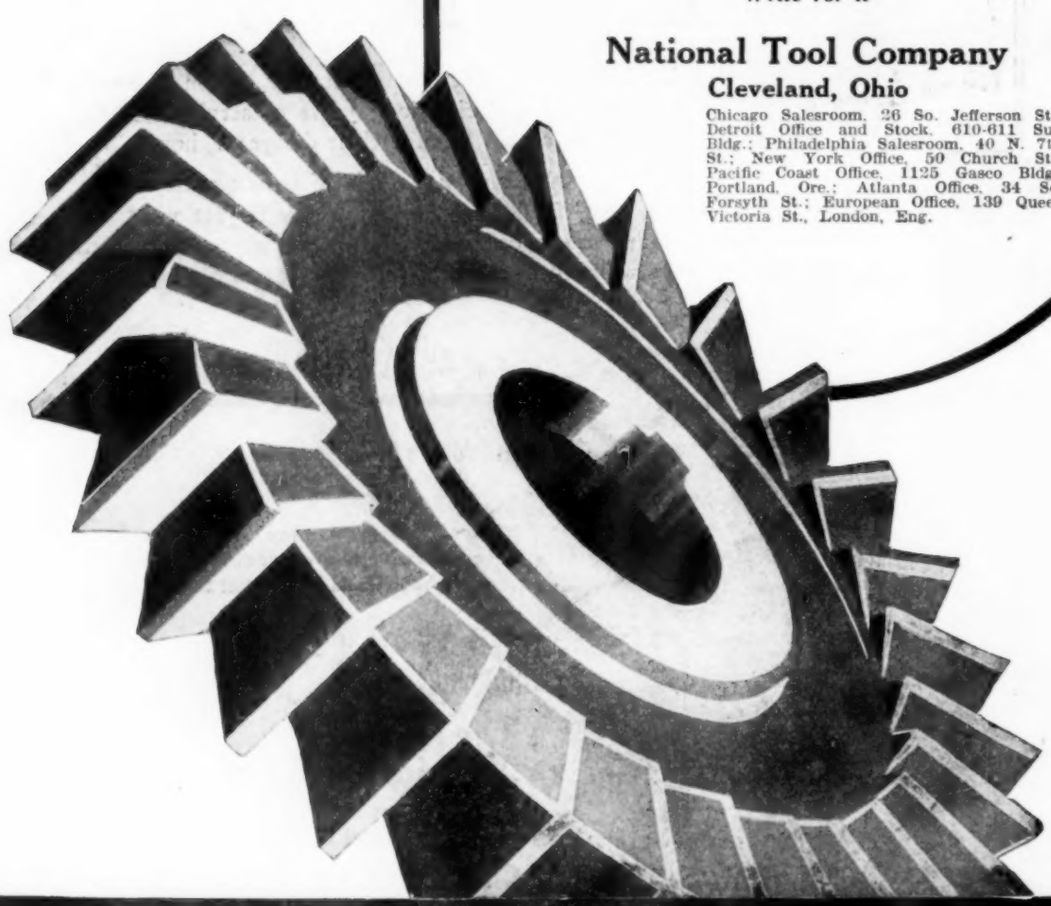
A Line As Broad As Your Needs

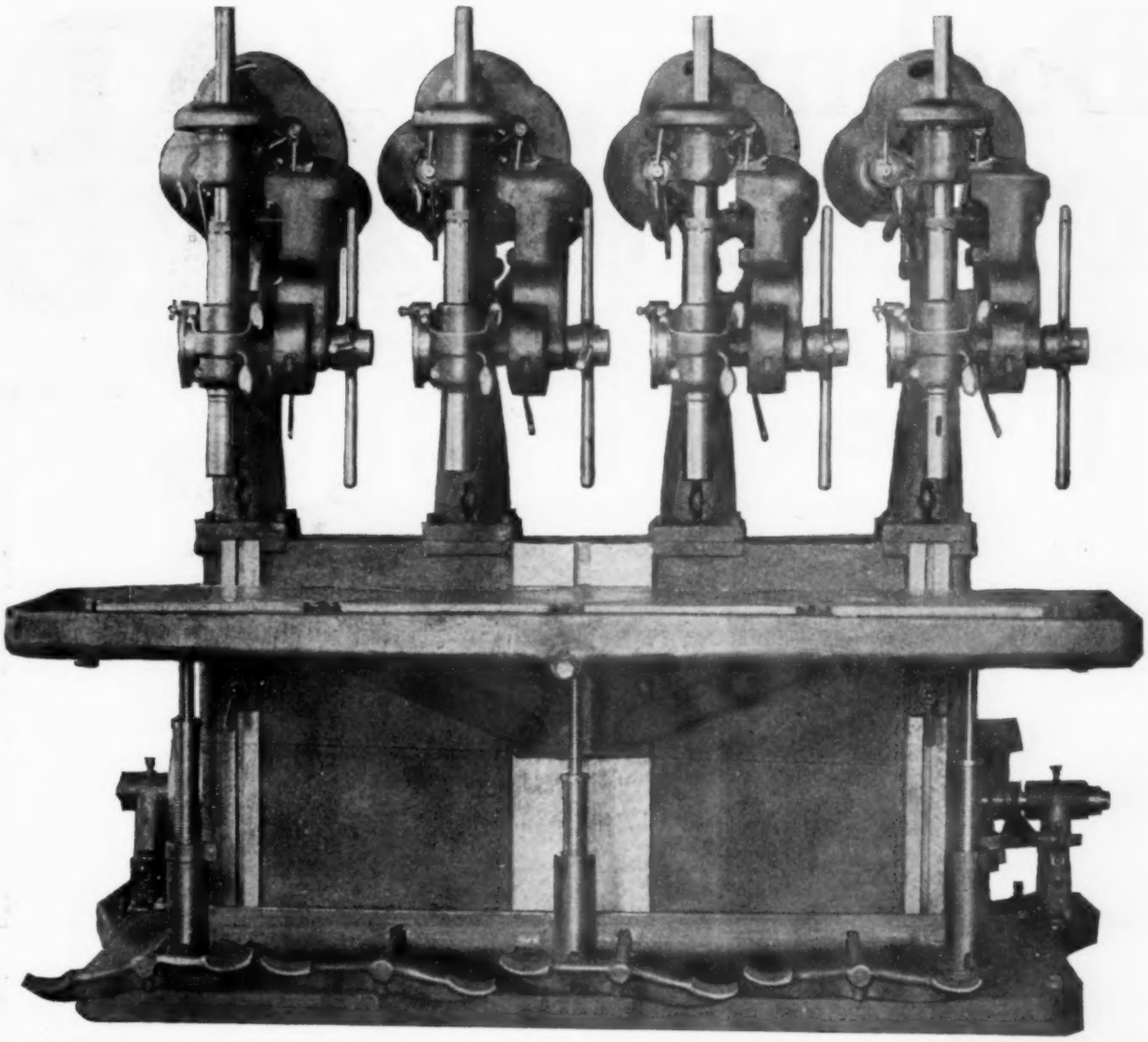
By studying shop needs for many years, we have produced a line of cutting tools as broad as the needs of your shop. The most intricate National-Cleveland cutter has the same characteristics as the plainest—an edge that cuts fast, material that lasts long, and construction that needs little operating attention.

Our stock list has many surprises for you
Write for it

National Tool Company
Cleveland, Ohio

Chicago Salesroom, 26 So. Jefferson St.; Detroit Office and Stock, 610-611 Sun Bldg.; Philadelphia Salesroom, 40 N. 7th St.; New York Office, 50 Church St.; Pacific Coast Office, 1125 Gasco Bldg., Portland, Ore.; Atlanta Office, 34 So. Forsyth St.; European Office, 139 Queen Victoria St., London, Eng.





FOR HEAVY WORK

Here's a machine that will stand the gaff of heavy duty drilling, one that will deliver the goods through long periods of time.

It is a Rockford 23-in. Star Lever Gang Drilling Machine. It is fitted complete with Power Feed and Positive Drive External Back Gears.

Special features include a Dial Trip, Right Angle Single Pulley Drive and Separate Friction Clutch for each spindle. A geared tapping attachment, oil pump, tank and piping will be furnished when desired.

ROCKFORD DRILLING MACHINE CO.

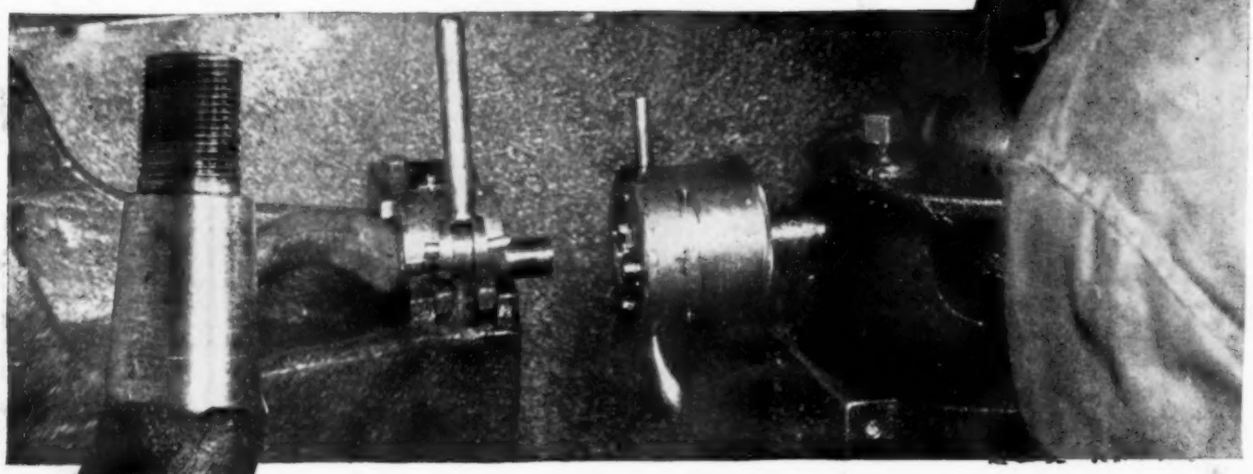
Rockford, Ill.

ROCKFORD

E. L. Essley Machinery Co., 552 Washington Blvd., Chicago, Ill.; Marshall & Huschart Machinery Co., 334 North Capitol Ave., Indianapolis, Ind.; Marshall & Huschart Machinery Co., 905 Chemical Bldg., St. Louis, Mo.; Henry Prentiss & Co., Inc., Singer Bldg., New York City, N. Y.; Henry Prentiss & Co., Inc., 724 Prescott Ave., Scranton, Pa.; Herberts Machinery & Supply Co., 405 E. Third St., Los Angeles, Calif.; Henry Prentiss & Co., Inc., 607 D. S. Morgan Bldg., Buffalo, N. Y.; Henry Prentiss & Co., Inc., 49 Federal Street, Boston, Mass.; Henry Prentiss & Co., Inc., 520 University Block, Syracuse, N. Y.; Henry Prentiss & Co., Inc., 315 E. & B. Bldg., Rochester, N. Y.; Somers, Fitler & Todd Co., 323 Water Street, Pittsburgh, Pa.; Monarch Machinery Co., 300 Third Street, Philadelphia, Pa.; Strong, Carlisle & Hammond Co., 270 Jefferson Ave., Detroit, Mich.; Strong, Carlisle & Hammond Co., 326 Frankfort Ave., N. W., Cleveland; Herberts Machinery Co., 168 Second Street, San Francisco, Cal. **Foreign Representative:** Burton, Griffiths & Co., London.

Boehm Die Heads

Automatic, Positive Opening, Adjustable



Four Years on this Job

This Boehm Die Head has been threading forged steel steering arms for four years at Timken-Detroit Axle Company's plant. The steering arms are used on trucks. A U. S. thread, 14 to the inch, is cut to 1¼ in. length, as shown by the illustration.

The Boehm Die Head threads these steering arms at the rate of 125 per hour. The chasers are good for 1300 pieces before regrinding is necessary.

Boehm Die Heads are Automatic, Positive Opening, and Adjustable.

They are made in twenty-one sizes, from ⅜ to 9 in., with either taper attachment or roughing and finishing attachment.

If it's threading use a Boehm

Descriptive circular sent promptly upon request.

Rickert-Shafer Company, Erie, Pa.

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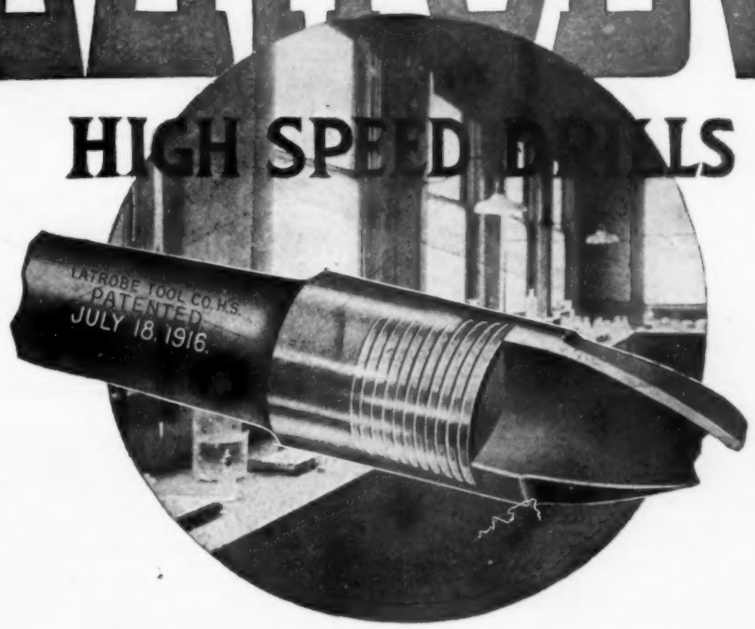
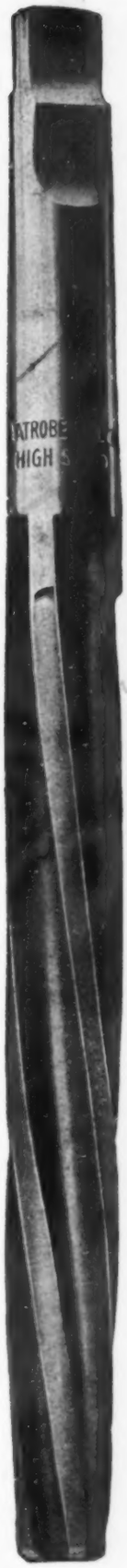
Latrobe

HIGH SPEED DRILLS





Practically and Scientifically Correct

ALL **Latrobe** *DRILLS ARE MILLED*

The selection of material for **Latrobe** Drills is of vital importance—Only the finest quality SPECIAL SECTION HOT ROLLED HIGH SPEED STEEL is used. This steel is manufactured especially for **Latrobe** Drills, and adopted only after a series of exhaustive tests.—It is a high speed steel particularly suited to hard service, consequently, due to the steel used, and method of their construction, **Latrobe** Drills will resist severe torsonial strain and will overcome inequalities in the material being drilled.—They are High Speed Drills in every sense of the word— **Latrobe** Drills have all the reserve strength of a forged drill plus the accuracy of a milled drill.

LOOK FOR THE NAME **Latrobe** ON THE SHANK

LATROBE TOOL CO.

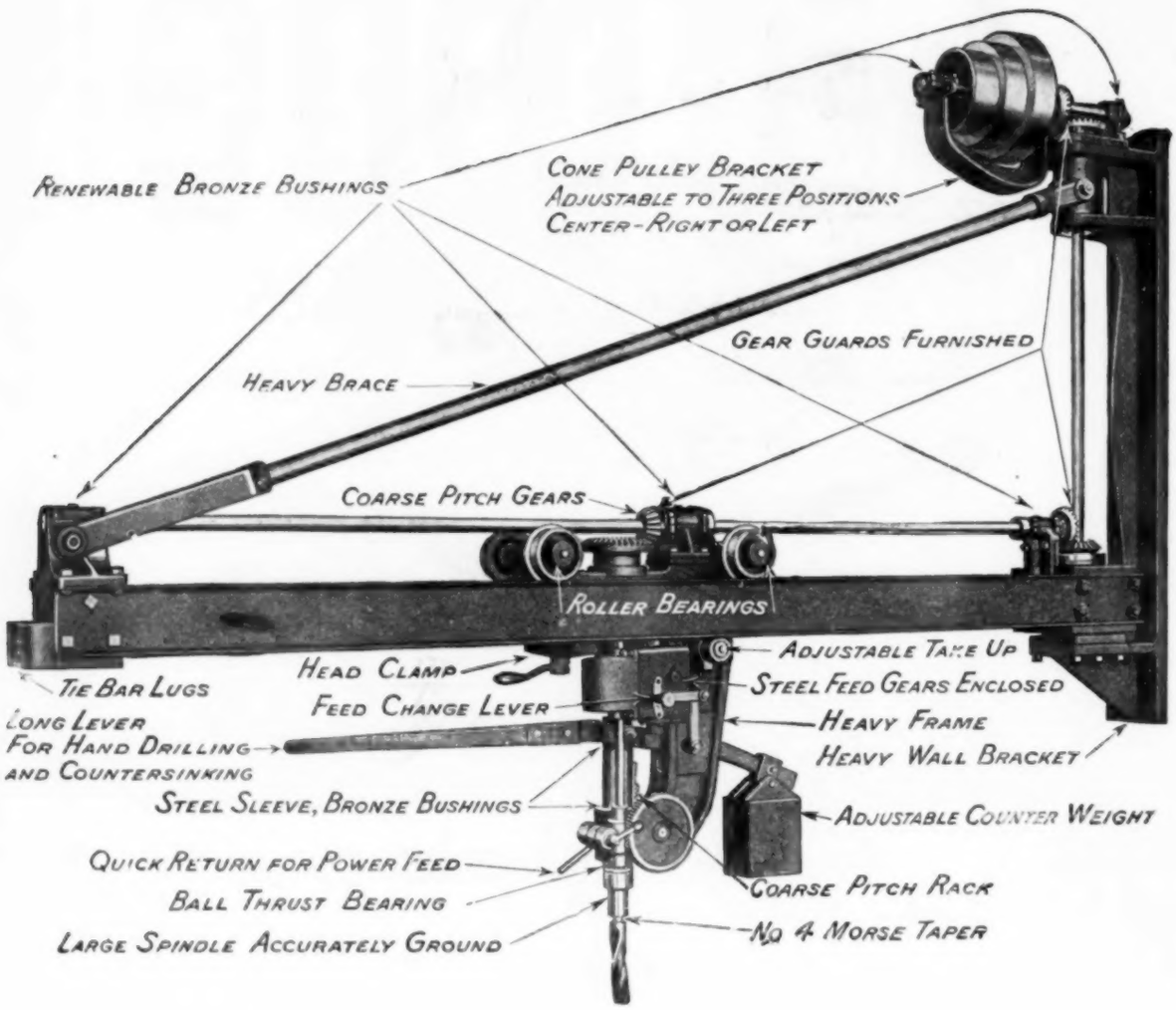
MANUFACTURERS

LATROBE, PENNA.

The hot rolling of this special high speed steel section compresses the steel in the center, therefore when the drill is twisted the toughest portion is in the exact center.

FOUR FLUTE
SPIRAL REAMER

LYND-FARQUHAR



Your Wall Is Cheaper Than a New Building

When you begin to get shy on surplus floor space—take your radials off the floor. Put them up on the wall.

New buildings are a poor investment because the cost is so high, but the wall is still as cheap as ever. Then again the L. F. Wall Radial has a greater range than the floor radial, because it can be swung in a semi-circle and the head moved back and forth.

Our catalog will give you full details. Send for a copy.

LYND-FARQUHAR CO.

Also builders of Openside Planers

Roston, Mass.

SPRINGS, WIRE & STEEL
EST.
"BARNES-MADE" PRODUCTS
1857
SCREW MACHINE PRODUCTS

Reducing the Cost of Milling

There are many light parts that require milling, yet hardly justify the installation of special milling machinery in your shop.

Here's where the *"Barnes-Made"* milling department will save you money.

We have the facilities and are prepared to mill any part according to your exact specifications.

Accuracy down to .001 of an inch and prompt, speedy deliveries are assured features of Barnes Service. Just specify—we'll supply.

Complete facilities for profiling

BY INVITATION MEMBER OF

NEW YORK, U.S.A

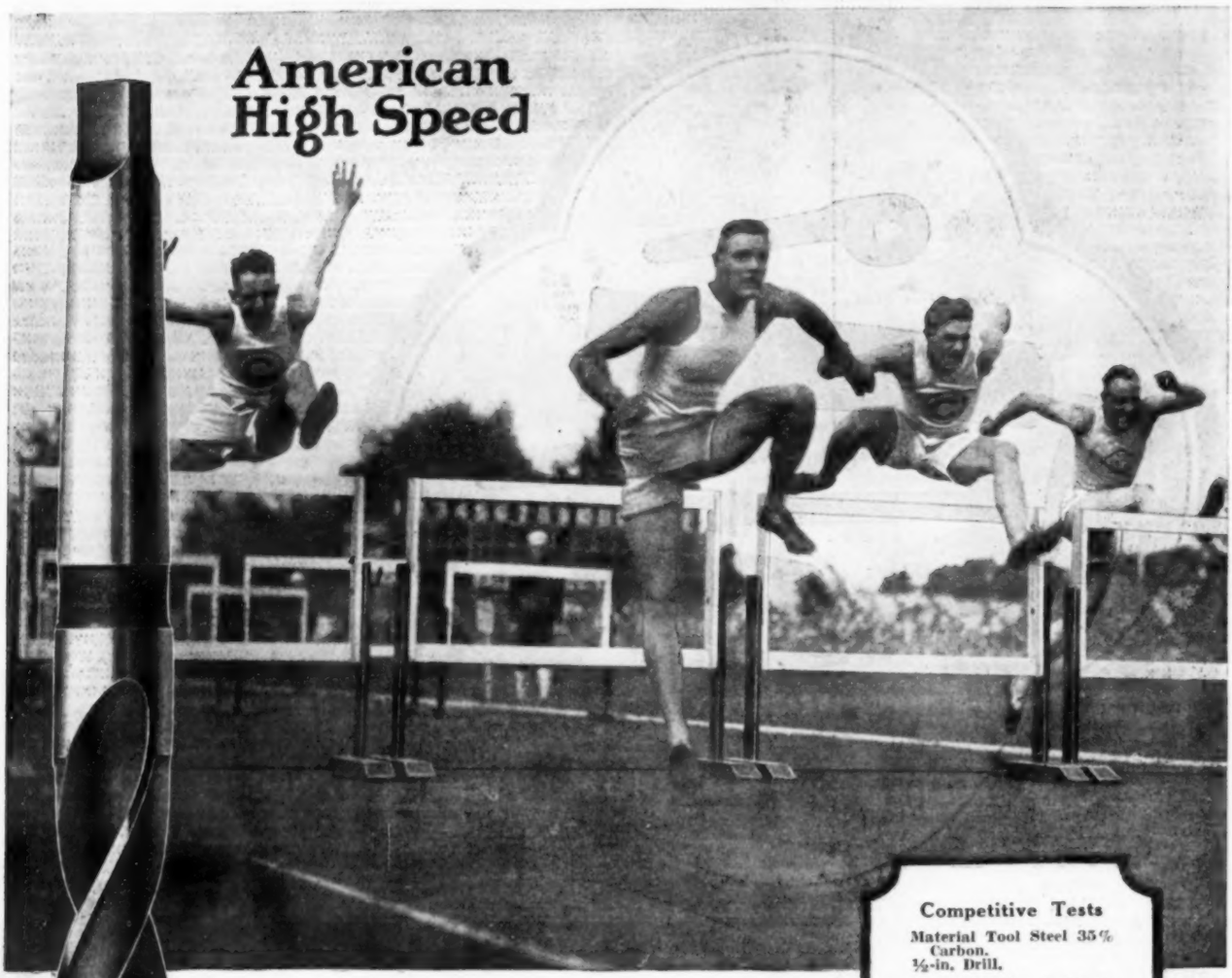
The Wallace Barnes Company

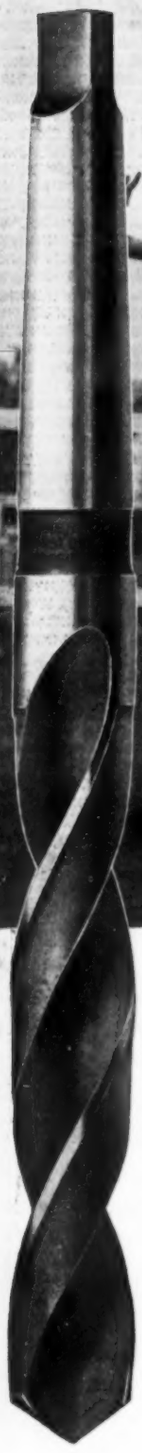
"Spring Makers for Three Generations"

Main Office and Works - Bristol, Conn.

Western Sales Division, Book Bldg., Detroit.

American High Speed





Competitive Tests

Material Tool Steel 35% Carbon. ½-in. Drill.

Competitor No. 9, No. 8, No. 3.

Competitors Nos. 9 and 8 failed to drill one hole.

Competitor No. 3 drilled 1½ holes.

American Drill drilled 6 holes.

Breaking All Records for Speed

American Forged High Speed Drills

Expert hurdlers are noted for their sinewy strength, perfect poise and powers of endurance. American Forged Twist Drills are deservedly famous for their ability to stand up under the severe punishment of hard drilling at high speed. Their lasting qualities under such conditions insure exceptional economy and maximum output.

In the race for greater production, high speed drilling is an absolute necessity, and American Forged High Speed drills are setting the pace.
Furnished in sizes $\frac{3}{16}$ inch upwards.

We guarantee every drill we make

American Twist Drill Company

Detroit Michigan

BRANCH OFFICES: Equipment Manufacturing & Supply Co., 26 N. Fifth St., Philadelphia, Pa.; William Brewster Company, Inc., 30 Church St., New York; Stevenson Bros. Sales & Engineering Co., 702 Farmers Bank Bldg., Pittsburgh, Pa.; American Twist Drill Company, 1700 State Lake Bldg., Chicago, Ill.; Connelly & Kendall, Guardian Bldg., Cleveland, O.; J. G. Miller, Commonwealth Bldg., St. Louis, Mo.; Charles A. Dowd Sales Company, 320 Market St., San Francisco.

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"Wells" Universal
Cutter and
Reamer Grinder
with full equipment
Buy from your nearest machine tool
dealer as shown in the border
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The Tap with the Continuous Taper

A method by which you can't tell where the taper thread enters the straight thread, thereby producing a uniform cutting edge which distributes the work.

BRUBAKER

Special Tempered Relieved Staybolt Taps

A bigger day's output — truer and more perfect threads — satisfied workmen — long lived taps. These are but a few of the many good results from using Brubaker Special Tempered Relieved Staybolt Taps.

Higher motor speed is possible with Brubakers because their special temper insures against fracture. Faster cutting means more holes per shift and cleaner holes result from Brubaker use because they all have a special relief.

Every hole tapped with a Brubaker will be an exact counterpart of its predecessor and every tap will tap at least 20% more holes.

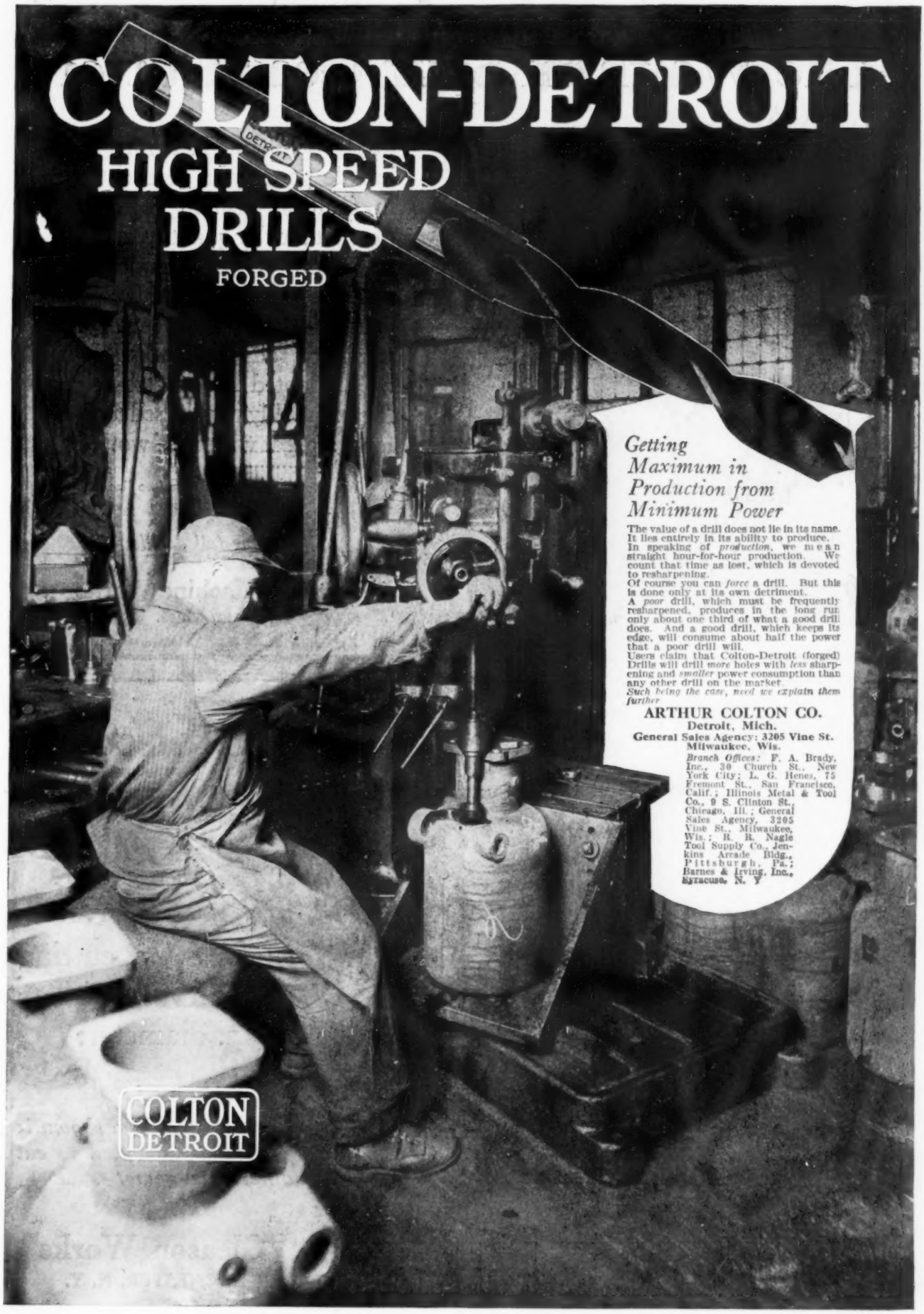
Over 30 years' experience in the tapping field gives us the tap "Know How." Ask us.

W. L. BRUBAKER BROS., 50 Church St., New York

COLTON-DETROIT

HIGH SPEED DRILLS

FORGED



Getting Maximum in Production from Minimum Power

The value of a drill does not lie in its name. It lies entirely in its ability to produce.

In speaking of *production*, we mean straight hour-for-hour production. We count that time as lost, which is devoted to resharpening.

Of course you can *force* a drill. But this is done only at its own detriment.

A *poor* drill, which must be frequently resharpened, produces in the long run only about one third of what a good drill does. And a good drill, which keeps its edge, will consume about half the power that a poor drill will.

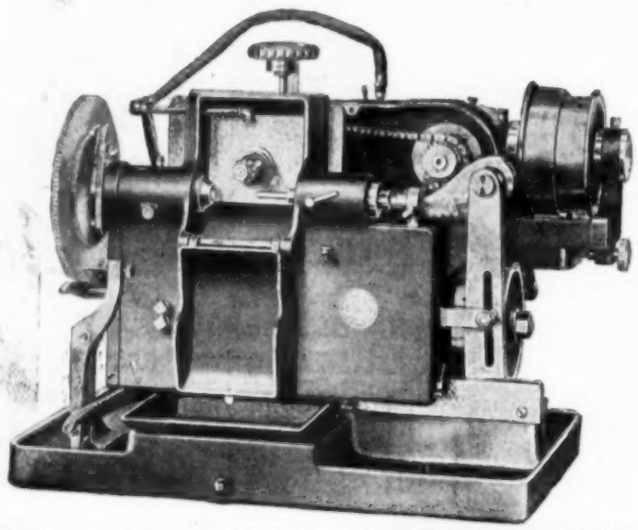
Users claim that Colton-Detroit (forged) Drills will drill *more* holes with *less* sharpening and *smaller* power consumption than any other drill on the market.

Such being the case, need we explain them further

ARTHUR COLTON CO.
Detroit, Mich.
General Sales Agency: 3205 Vine St. Milwaukee, Wis.

Branch Offices: F. A. Brady, Inc., 30 Church St., New York City; L. G. Henes, 75 Fremont St., San Francisco, Calif.; Illinois Metal & Tool Co., 9 S. Clinton St., Chicago, Ill.; General Sales Agency, 3205 Vine St., Milwaukee, Wis.; R. B. Nagle Tool Supply Co., Jenkins Arcade Bldg., Pittsburgh, Pa.; Barnes & Irving, Inc., Syracuse, N. Y.

The Waltham Spur Gear Cutter

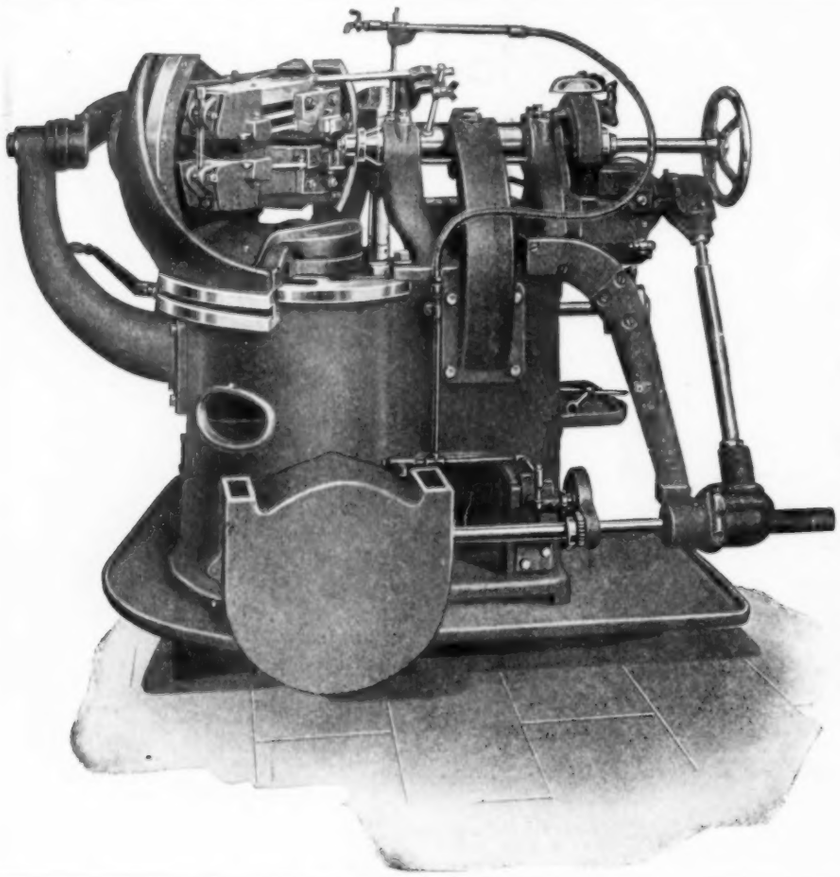


This Waltham Machine will handle your spur gear cutting in faultless fashion regardless of whether the quantity is large or small. It is intended for bench use. You can attach the counter-shaft to the wall by means of rods or planks. It is well adapted for motor-drive. It can quickly be utilized to perform a great variety of work.

We also manufacture a complete line of Dies and Sub-Presses.

Write for full details

Waltham Machine Works
Waltham, Mass.



Gleason Generators

are made in sizes suitable for cutting gears from ½ in. to 37 in. diameter.

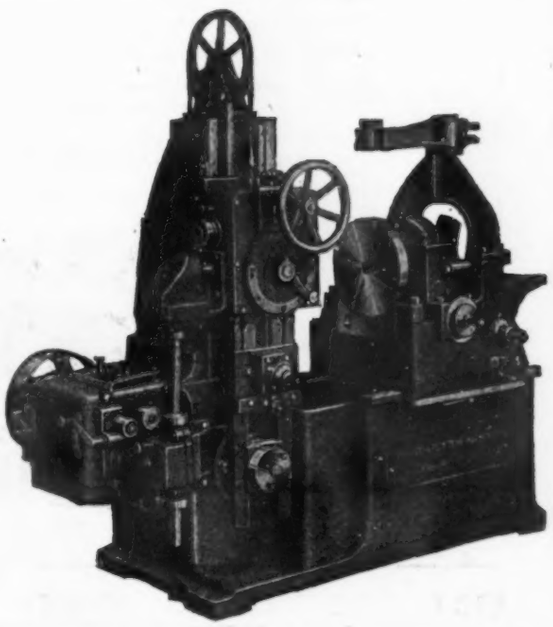
The 6-in. machine shown is particularly adapted to cut differential gears.

Gleason Works
ROCHESTER, N. Y.

You will have no regrets if you Cut your Cams on a Rowbottom

Every cam cut in a *Rowbottom* Cam Milling Machine will be a good cam—absolutely accurate and perfect in finish; no need of expensive hand finishing after the cutting has been done. *Rowbottom* Machines pay their own way in savings to the owners.

We are well equipped to cut cams for you if your requirements do not warrant the purchase of a machine. The quality of our work is sure to please.



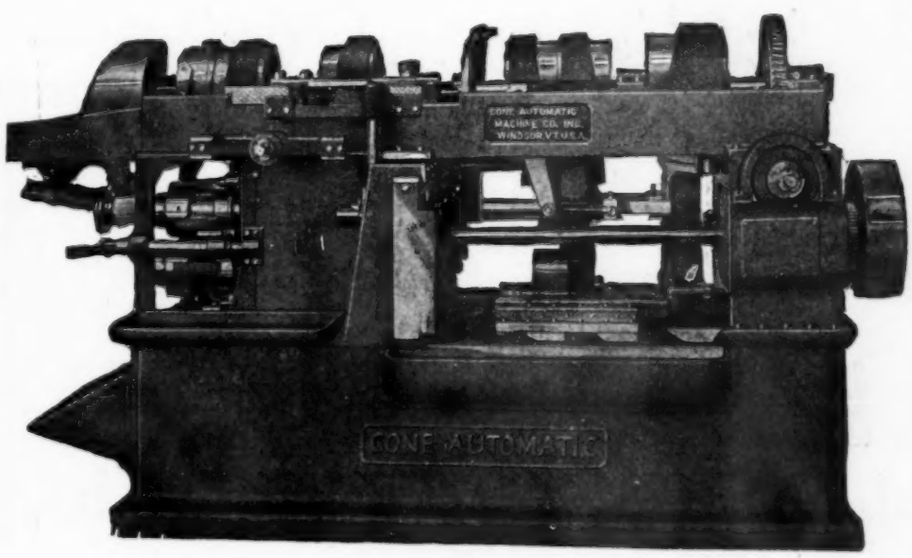
Write today for full information

The Rowbottom Machine Co.
Waterbury, Conn.

Factory, Waterville, Conn.

Rowbottom for Cams

You Will Like This New Model Even Better The CONE Automatic Four Spindle Machine



Cone Automatics are made in four sizes: 1 in., 1¼ in., 1½ in. x 6 and 3½ in. x 7 in. long. Work is positively accurate.

Our catalog will give you a complete description. Send for a copy.

Cone Automatic Machine Co.
Windsor, Vermont

Agent for Michigan Territory: J. C. Austerberry, 65 Shelby St., Detroit, Michigan.

Plate Edge Planers

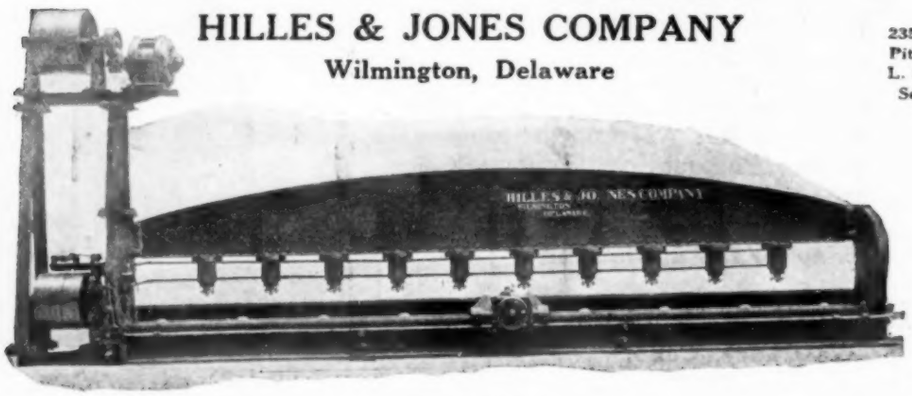
H. & J. Plate Edge Planers are built to meet your requirements. An order for this type of machine placed with us is absolute insurance that your specifications will be filled. Housings are of overlapping type, permitting any length of plate to be planed by successive settings.

Clamping may be by pneumatic or hydraulic jacks at positive centers, hand screw jacks or hydraulic cylinders in housings.

Driving screw is supported its entire length in planed groove bed and fitted with roller bearing thrust collars. Write for complete details.

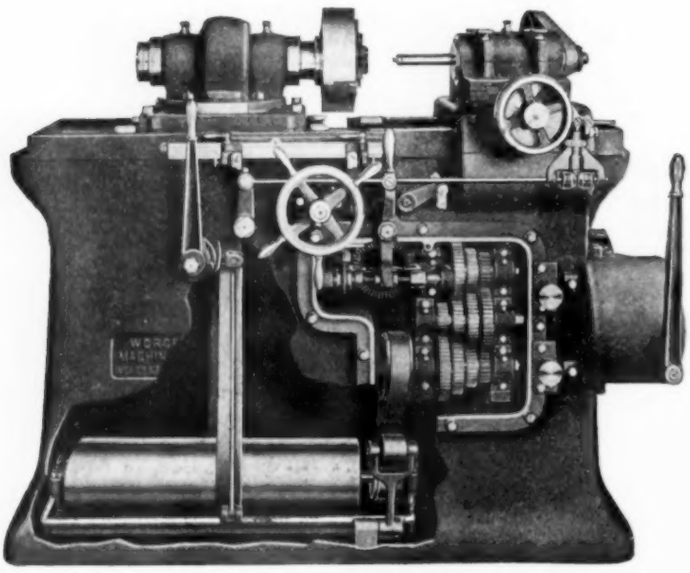
HILLES & JONES COMPANY
Wilmington, Delaware

235 Oliver Bldg., Pittsburgh, Pa.
L. C. Smith Bldg. Seattle, Wash.



One of the Hilles & Jones Metal Working Machines

Grinds Without Vibration



Sturdy, massive design, with metal scientifically distributed to avoid strains and absorb vibration, is one of the big points about this new

CHURCHILL Internal Grinder

Other features besides rigidity tend also to reduce the chance of vibration. For instance, the spindle head on this machine has only one motion — crosswise — instead of the usual two. The workhead has the longitudinal motion. This arrangement greatly reduces the chance of a vibrating spindle since the cross slide plate is mounted on a bridge by ways and gibs, the bridge being bolted securely to the base.

These points are all discussed in detail in our new bulletin and we will gladly forward this material to any man asking for it.

CHURCHILL-MORGAN-CRITTSINGER, Inc.

Formerly WORCESTER MACHINE WORKS, Inc.

393 Main Street, Worcester, Mass., U. S. A.

Fischer Oil Groover

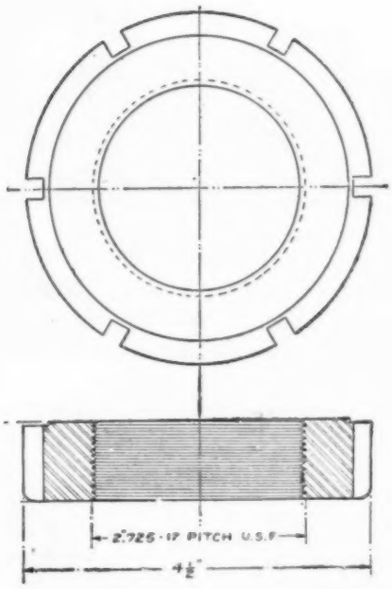
Will cut almost any style of groove. It will cut the oil grooves faster and better than other improvised methods.

Complete data upon request

Fischer Machine Company
310-316 No. Eleventh St.
Philadelphia, Pa.

Agent: Chas. A. Strelinger, Detroit, Mich.

A Smalley General Thread Miller



Saved 18 Minutes on this job

As an inexpensive aid to reducing your manufacturing costs we urge you to investigate the savings a Smalley General Thread Miller will effect for you.

This example of their efficiency is typical. The material of this piece is soft steel. Time required to mill the threads in a lathe was 20 minutes epproximately. Time required on a Smalley General Thread Miller was only 2 minutes—a saving of 18 minutes over the lathe method.

Smalley General Co., Inc.
Machinery Builders
Bay City, Michigan

Smalley General Thread Millers will only be sold with the approval of our Engineering Department. A guaranteed production estimate will be furnished with each machine. In the event a machine should not perform and produce according to our guarantee, the purchaser will have the unquestioned right to cancel the sale.

The Best Light Assured

The best light obtainable is assured with the

THURSTON

DIE MILLING MACHINE

because the frame swinging on trunnions can always be turned toward the best light by the operator.

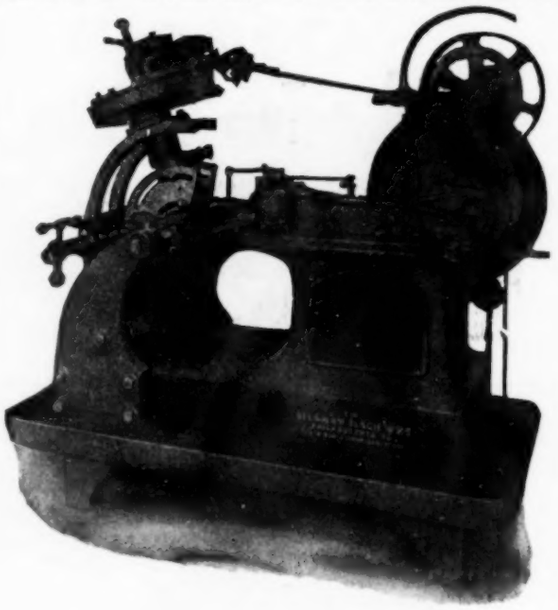
With the THURSTON it is only necessary to bore one hole in the die block before starting work. After that the die is milled in one operation. A positive but flexible screw feed enables the shape of the die to be followed so closely that minimum filing is required.

The THURSTON catalogue will be forwarded on request

Makers of THURSTON SAWS and THURSTON FILING MACHINE

THURSTON MFG. CO.
Providence, R. I., U. S. A.

BEVEL GEAR GENERATORS



Bevel Gears

are cut by us theoretically correct, and so are adapted to fine machinery of all kinds. We have special facilities for cutting SPUR, WORM, SPIRAL, MITRE, INTERNAL and ELLIPTICAL Gear Wheels. Let us quote on your specifications.

The Bilgram Machine Works 1233 Spring Garden St. Philadelphia, Pa.

Wood Screw Making Machinery

Send for Catalogue Series "B3"

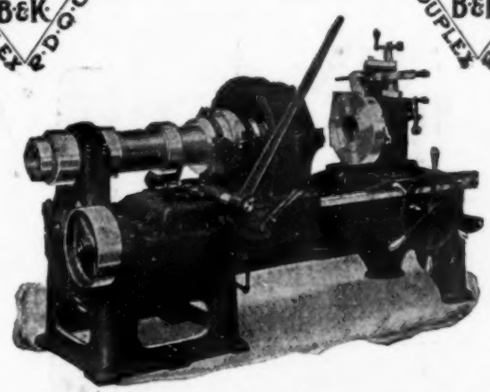
The manufacturing of efficient Automatic Machinery for making screws of the types shown above has been the constant study of this company for sixty years.

Cable Address: "Cook, Hartford, U.S.A."

Codes, Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

PEERLESS B&K DUPLEX P.D.Q.G

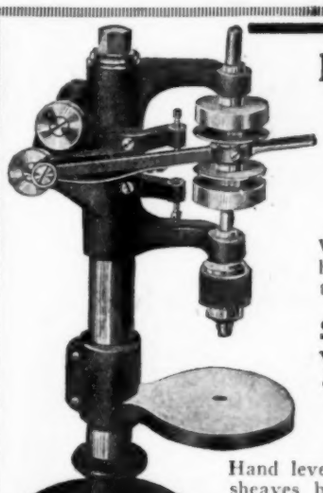


Rapid and Accurate Pipe Threading

Is the kind done by B & K Pipe Threading Machines. They work with remarkable rapidity and ease of operation. Every thread is clean and accurate. Every machine is equipped with the Peerless Die Head. Made in nine sizes, each size having a capacity of 8 to 10 sizes of pipe.

Write for complete catalog

Bignall & Keeler Machine Works
Edwardsville, Ill.



Ideal for Small Tapping—Weighs 14 pounds

Wherever precision and handy control are important, this

S. & C. Vertical Lever Tapping Machine

has become standard.

Hand lever controls travel of two sheaves by friction clutches, thus driving spindle in either direction with equal power.

Swinging table 3½ in. diameter. Height of machine 12½ in., distance from spindle to table 4 in. Drill chucks (Jacobs Chucks used as regular Equipment), capacity $\frac{3}{16}$ in., can be supplied.

Write for Details

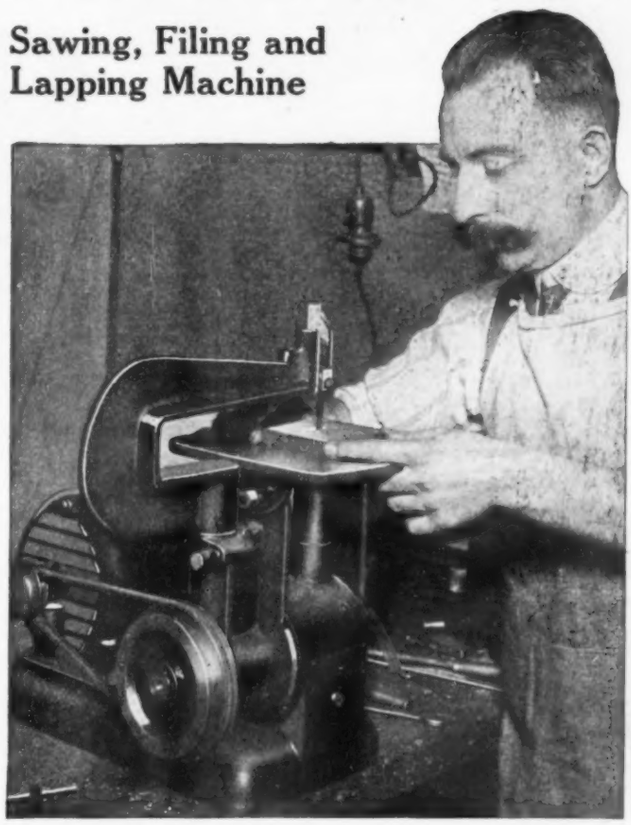
Sloan & Chace Mfg. Co., Ltd.
6th Ave. and No. 13th St., Newark, N. J.

See our exhibit Grand Central Palace New York City

Manufacturers of Precision Machinery, Bench Lathes, Drill Presses, Milling Machines, Gear and Pinion Cutters, Tools, Fixtures and Gauges

OLIVER OF ADRIAN

Sawing, Filing and Lapping Machine



L. T. Schaffert, of Joseph Weidenhoff Co. (makers of automobile appliances in Chicago), hold the "Oliver" Sawing, Filing, and Lapping Machine high in his estimation. He maintains that not only can dies, templates, and innumerable other things be made on it in a fraction of the time ordinarily required by hand-work, but it is a very durable, strong, and accurate machine as well.

A BLANKING die is, in this case, being sawed out of tool steel about ¾ in. thick. The great advantage which the "Oliver" offers in work of this character is its ability to saw up close to the mark. Then, when the piece is filed down, only a few thousandths of an inch of stock need be removed. A great saving of time is in this way effected.

"Oliver" Sawing, Filing and Lapping Machines are made in two styles—bench and pedestal. They are suitable for any kind of sawing and filing on iron, steel, bronze, brass or copper. Type S4 Bench machine shown in illustration.

If YOU have any of this kind of work to do, write to us for the "Oliver" Catalogue.

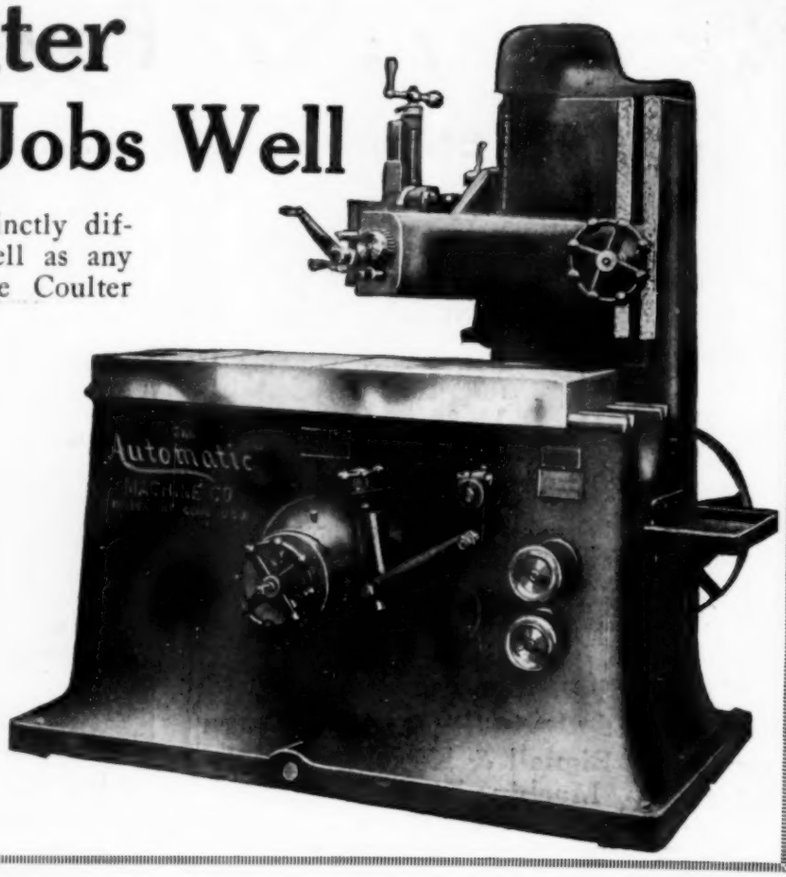
OLIVER INSTRUMENT CO.
ADRIAN, MICHIGAN

The Coulter
Does Two Jobs Well

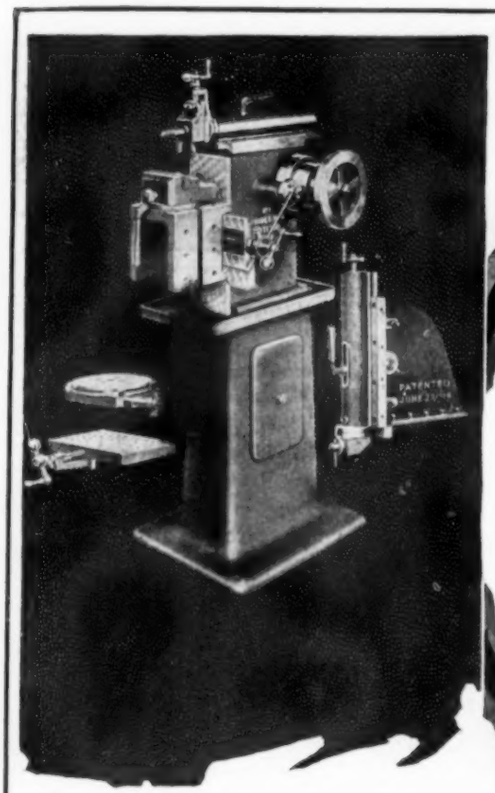
Planing and shaping, two distinctly different jobs, can be done as well as any special duty machine with the Coulter Openside Planer.

The entire control is handy and centralized. The operation of the machine is comparatively simple.

Our booklet will give you the data you want. Send for a copy.



"The Automatic" Machine Company
Bridgeport, Conn., U. S. A.
Paris, Turin, Zurich and Barcelona.



"The finest little machine of the kind ever put in my shop—accurate beyond all expectations!"

The above verdict was rendered by the man in charge of a great machine tool company at Syracuse, N. Y., after just one year's experience with the

RHODES
7-in. Horizontal
3½-in. Vertical
SHAPER

It saved his company time and money in machining small work and will do the same for yours.

Write for illustrated circular to Dept. 103

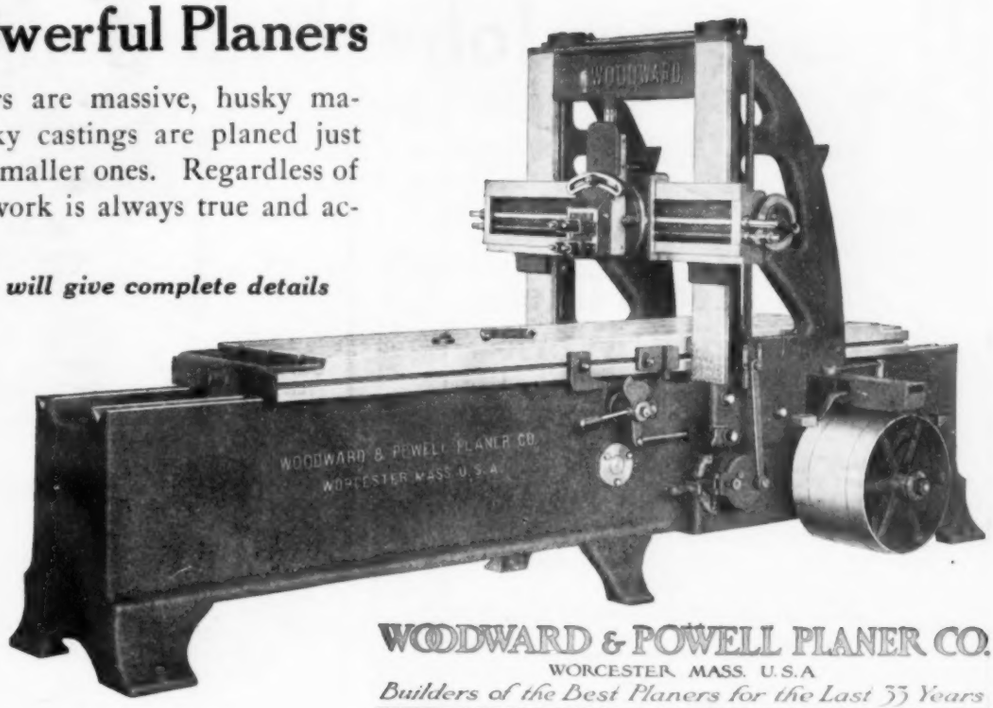
The Rhodes Mfg. Co.
Hartford
Connecticut

Woodward & Powell Planers

The Powerful Planers

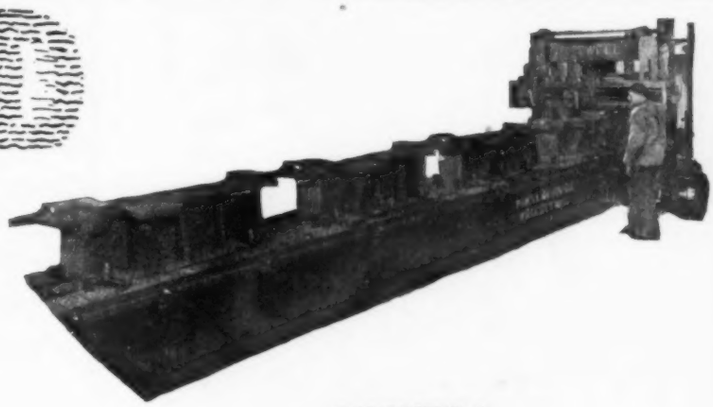
These planers are massive, husky machines. Bulky castings are planed just as readily as smaller ones. Regardless of the size the work is always true and accurate.

Our catalog will give complete details



WOODWARD & POWELL PLANER CO.
WORCESTER MASS. U.S.A
Builders of the Best Planers for the Last 33 Years

SPEED



Production is the 1920 slogan, and speed in machining operations must back it up. The Powell *"Hy-Speed Cut"* Planer has established a production reputation second to none. It will plane metal at a speed as high as 120 ft. per min. (according to the nature of the material).

The tool enters the cut at normal speed and immediately accelerates. This acceleration is held until near the end of the cut is reached where the tool is retarded for reverse and quick return.

Eocnomize in your planing department by putting it up to Powell.

Get the Powell folders—they are interesting

Powell Machine Company
243 Stafford St., Worcester, Mass.

POWELL
"Hy-Speed-Cut"
PLANERS

The Mark of Planer Predominance

BRISTOOL

The Ideal Miller For Small Work

Why tie up your large milling machines with small work? They were made for the big milling jobs, and the Bristol Hand Milling Machine was made for handling your small milling jobs.

The "Bristol" is provided with a power feed attachment. It is most economical and productive on milling small duplicate parts.

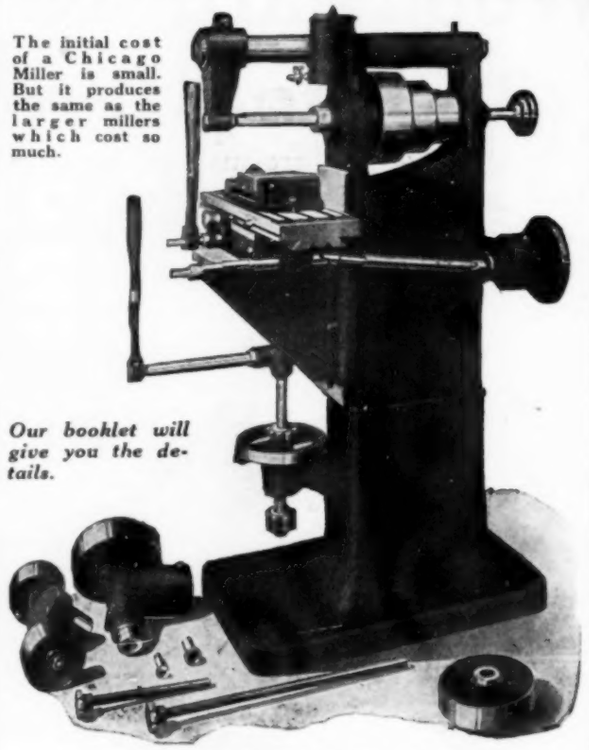
Let us tell you how it will aid you in reducing your manufacturing costs.

Bulletin 10-PM, sent on request contains full details.

Bristol Machine Tool Co.
Successors to
C. G. Garrigus Machine Co.
Bristol, Conn.

Small Cost—Large Production

The initial cost of a Chicago Miller is small. But it produces the same as the larger millers which cost so much.

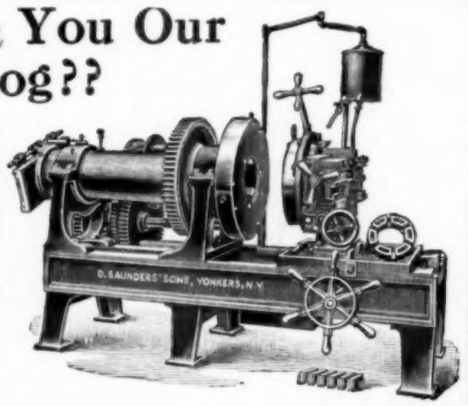


Our booklet will give you the details.

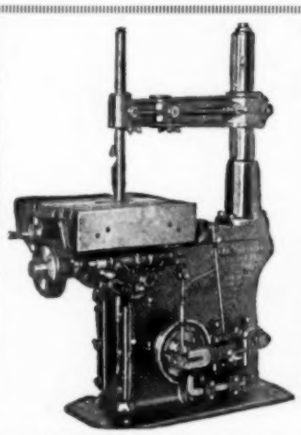
Chicago Machine Tool Co.
647 Washington Blvd., Chicago, Ill., U. S. A.

Have You Our Catalog??

If not, write us asking for Catalog "M"— a book describing in detail the many superior points regarding our famous line of **Pipe Cutting and Threading Machines.** We illustrate our No. 6 with patent adjustable expanding die head with interchangeable chasers.



D. Saunders, Sons, Yonkers, N.Y.



Fast Work

Baker Keyseaters will satisfy you perfectly on that score. But in addition to their speed

BAKER Keyseaters

are extremely accurate. The draw cut principle on which they operate accounts for this.

Our Bulletin on Keyseaters and Slotters gives the different sizes and complete information about these machines. Write for it.

BAKER BROTHERS
Toledo, O., U. S. A.

The STANDARD Hand Miller

Its Rigidity

prevents vibration and enables absolute accuracy on the heavy or small work.

Its Accuracy

is gained by smooth running, which is appreciated when doing close specification work.

Its Power

never fails. When rather bulky work must be turned out fast and accurately—you will appreciate the Standard mostly.

For complete details get our catalog

Standard Engineering Works
Pawtucket, Rhode Island

Does A Giant's Work

Built with a solid one-piece arch which gives it the rigidity of a punch press, the Briggs Heavy Duty Miller will stand up under any work you throw on it.

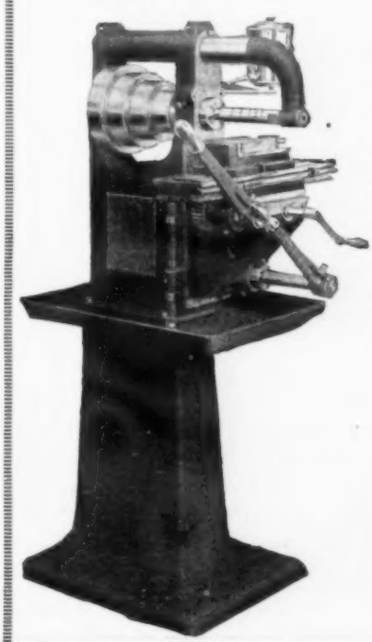
BRIGGS Heavy-Duty Miller

Gooley & Edlund, Inc., Cortland, N. Y.

Domestic Agents: Cleveland Duplex Machinery Co., Cleveland, O.

The Speed of a Wisconsin Hand Miller

Eight speeds can be obtained through the countershaft which allows big production on small duplicate parts.



The many cost reducing features of Wisconsin Hand Millers have made them the choice of prominent machine tool buyers throughout the country. Surely you will investigate this machine.

Write for details

Wisconsin Miller Mfg. Co.
Station A,
Milwaukee, Wis.

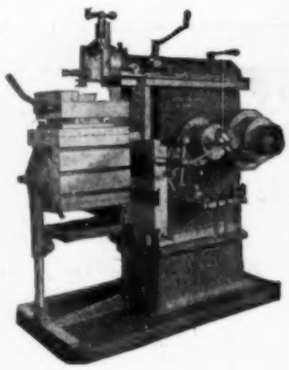
Smooth as Silk

The smooth and silent operation of the

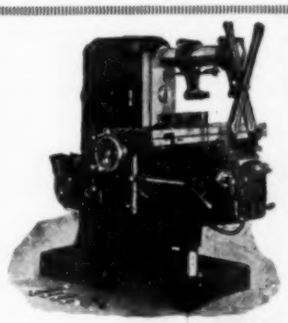
SELLEW
Double Purpose
SHAPER

is due to the convenience of adjustment. This machine has no equal for the tool room or in general manufacturing. Its extended height adds materially to its capacity and gives wider vise range.

All adjustments have been increased without impairing the convenience of operation. Our literature gives facts that command your attention. Let us have your name and address for our mailing list.



Sellew Machine Tool Company
Pawtucket, R. I., U.S.A.



We are manufacturers of Milling Machines, Milling Cutters, Universal Relieving Machines, Special Tools, Profile Grinders and Plain Vises.

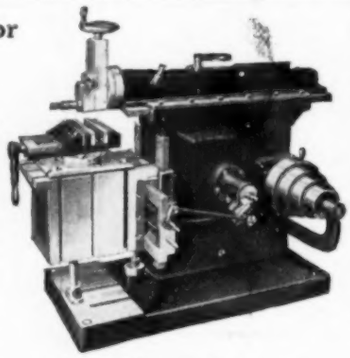
Write for information about any you are interested in before buying elsewhere—

Write for Our Stock List of Cutters

The Cleveland Milling Machine Co.
Cleveland, Ohio
New York Office: 1760-2 Woolworth Bldg. Detroit Office: 271 E. 435 Stock Exchange Bldg. Jefferson Ave. Pittsburgh Office: 203 Oliver Bldg. Chicago Office:

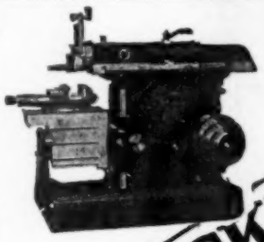
Can't be Beat for Fast, Accurate Shaping

Yet moderately priced—30 years' experience has produced many features in these shapers that permit quick adjusting and rapid production. Note extended base with table support. Steel rocker arm, and all gears of steel.



Built in 3 sizes: 16 in., 20 in., and 24 in.

The Osborne & Sexton Machy. Co.
Columbus, Ohio



Simple design, sturdy construction

STOCKBRIDGE SHAPERS

Write for Bulletin

The Stockbridge Machine Co.
Worcester, Mass.

IN A MINUTE
You Can Mill
KEYSEATS

with this tool. Save fifty to seventy-five per cent. in time. Small first cost; save more in operation. Mills all keyseats alike—no filing or fitting of keys required. This tool is an attachment for the drilling machine and is fitted with a high-speed steel rotary cutter that mills internal keyseats in one cut. **Write for Catalog D.**

National Machine Tool Company
2270-2272 Spring Grove Ave., Cincinnati, Ohio, U. S. A.
For Australia: R. L. Scrutton & Co., Ltd., Sydney, Australia.

Only reliable products can be continuously advertised

WE are manufacturers of Lincoln Type Milling Machines, Bench Milling Machines, Hand Milling Machines, and a line of reliable Screw and Lever Vises. Get our circulars and prices.

THE CARTER & HAKES MACHINE CO.
Winsted, Conn., U. S. A.

Enlarge Your Working Capacity the "Davenport" Way

The wide range of screw machine jobs and the large output made possible on the Davenport Multiple Spindle Automatic Screw Machine, enlarges the working capacity of any shop having this kind of work to do.

There's no sacrifice in accuracy or finish to get the "Davenport" output.

Many users say that they have taken on business which could never be touched under old production costs.

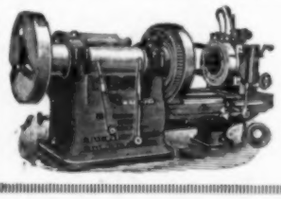
Let us send you our Catalog. *Now*

Davenport Machine Tool Co., Rochester, N. Y.

SHAPERS

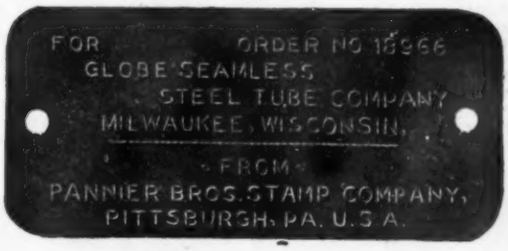
Smith & Mills Company
Cincinnati, Ohio
U. S. A.

Foreign Agents—C. W. Burton, Griffiths & Co., London. G. & F. Limbourg, Freres, Brussels. Van Reitschoten & Houwens, Rotterdam. Gleanzer Perreaud & Thomine, Paris. Stussi & Zwiefel, Milan.



Tube Mill Machinery—Seamless and Welded.
Rolling Mill Equipment. Rolls—Sand and Chilled
Pipe Threading and Cutting Machinery.
Castings—Gray Iron, Semi-steel, Cupola and Air Furnace.
Machine Work to drawings.

Standard Engineering Works, Ellwood City, Penna., U. S. A.



Address Your Own—

Metal Shipping Tags addressed on the *PANNIER* Metal Tag Addresser are indestructible and cannot become mutilated or defaced in any way. They will eliminate for you the greatest of all shipping worries—lost shipments.

The raised characters produced are bold and easily read, providing absolute insurance against miscarriage. The cost of one lost shipment would more than equal the cost of securing this protection.

Or, if you prefer, we can furnish the metal tags addressed as you require.

Investigate the merits of this addresser—the savings it will effect in your shipping department. Sample addressed tag on request.

Pannier Bros. Stamp Company, 207-209 Sandusky St. Pittsburgh, Pa.

COLUMBIA SHAPERS

Newer and Better

Heavy Duty Shapers of unusual merit. 16, 20, 24 and 28-inch.

Write us for details

The Columbia Machine Tool Co., Hamilton, Ohio

CLEVELAND Horizontal Boring Milling and Drilling Machine

Find out about this rigid, powerful, rapid producing, thoroughly modern machine. Centralized control makes easy operation. Adjustments against wear.

We'll be glad to send details

The Cleveland Machine Tool Co.

Cleveland, Ohio

We're on the Mark and Set — Will You Yell "Go!"

Just bid us "go" to your plant to put that broken-down engine back in service.

We'll do it, you know and in a jiffy—for we belong to the

Underwood Wrecking Crew

Making quick "getaways" is our habit. We're ready for your call any hour of the day or night—and with tools all packed.

When next a plant tie-up confronts you, don't worry—

Put it up to us.

H. B. UNDERWOOD CORP., Philadelphia, Pa.

CLEVELAND

THE CLEVELAND PLANER CO.

3148 SUPERIOR AVE. CLEVELAND O.

OPEN-SIDE

KELLY SHAPERS

Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. Three sizes single geared, four sizes back geared. Write for a Catalog.

THE R. A. KELLY COMPANY, Makers of shapers only for 25 years

P. O. BOX 488 XENIA, OHIO, U. S. A.

We are equipped to fill your stamping requirements, and to insure your obtaining the quality and service desired.

Send for our Catalog—mail us your inquiries.

KALES STAMPING COMPANY

453 Lafayette Blvd., West Detroit, Mich. **Canadian Plant Walkerville, Ont.**

A new way to Mill Threads

Hall Planetary Thread Millers

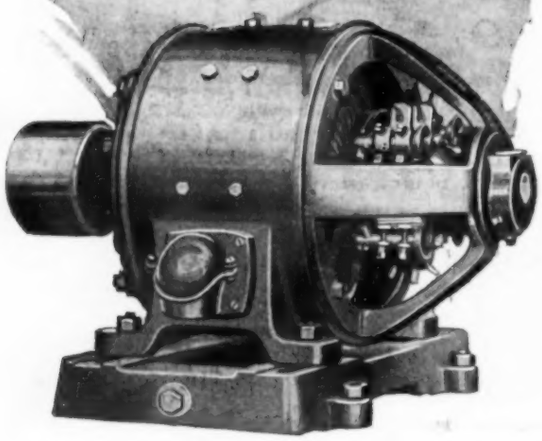
Reduces threading cost 50% on some classes of work. Cuts all style threads internal or external.

Write for particulars.

THE HALL PLANETARY THREAD MILLING MACHINE CO.,

Bridesburg, Philadelphia, Pa.

What makes a good motor? We say, "Correct design, good material, careful workmanship, plus rigid and repeated tests and inspections."



RC Direct Current **Motors**

½ to 200-horsepower.

Commercial Testing

WE show just a corner of one of our big motor buildings, where Type "RC" direct motors are being tested.

Motors are inspected for correct assembly and adjustment. Every motor is then belted to an individual generator and subjected to load.

During test careful checks are made to assure accurate brush setting and sparkless commutation, to guard against undue noise or vibration, to see that the lubricating system functions properly, and that rated speed is maintained.

Each motor is then given a "high potential" test, and finally, a rigid, general inspection before painting and shipping.

Our final "O.K." on scores of thousands of motors has to mean "just right," and it does.

45-56

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

An Efficient, Effective Arc Welder that Will Increase the Scope of Arc Welding in Any Shop—

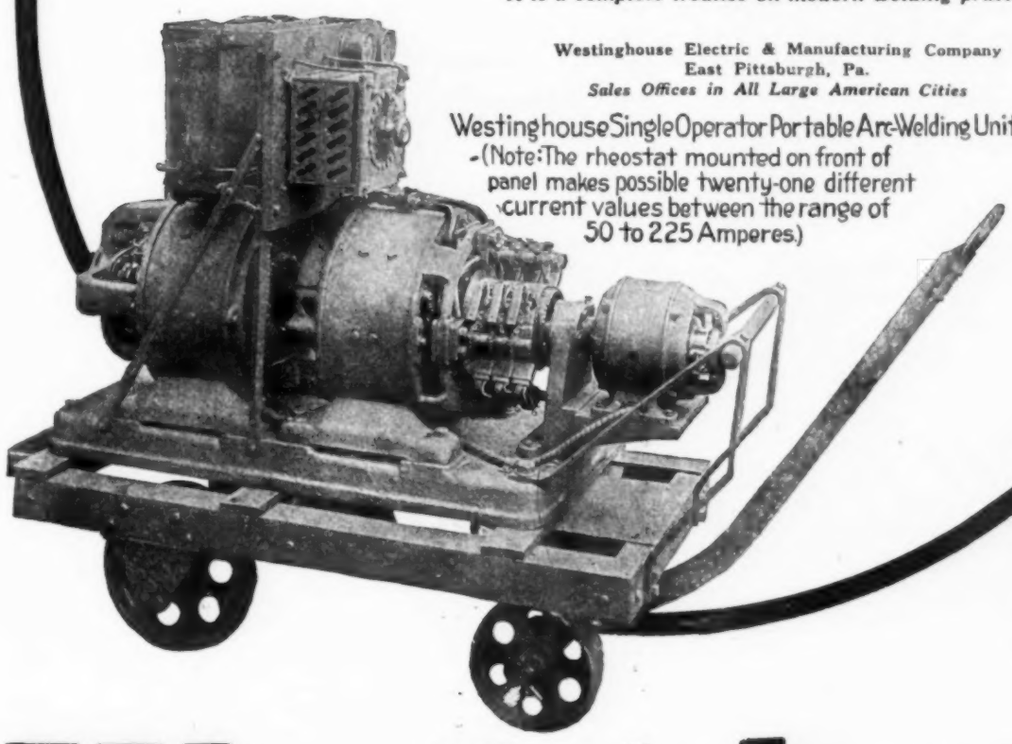
Light and Compact

Westinghouse single operator, portable arc-welding units for use where quick, reliable work is essential, are simple in construction and effective in operation. The welder's time is conserved by the ease with which the arc can be started and held.

Plenty of "pep" behind the arc gives proper penetration and this, combined with the facilities for obtaining practically any current value from 50 to 225 amperes, insures its application to all classes of welding work requiring metallic electrodes.

Repeat orders for these portable welders are regularly received from large railroad and machine shops.

Send for Arc Welding Circular No. 7149.
It is a complete treatise on modern welding practice.



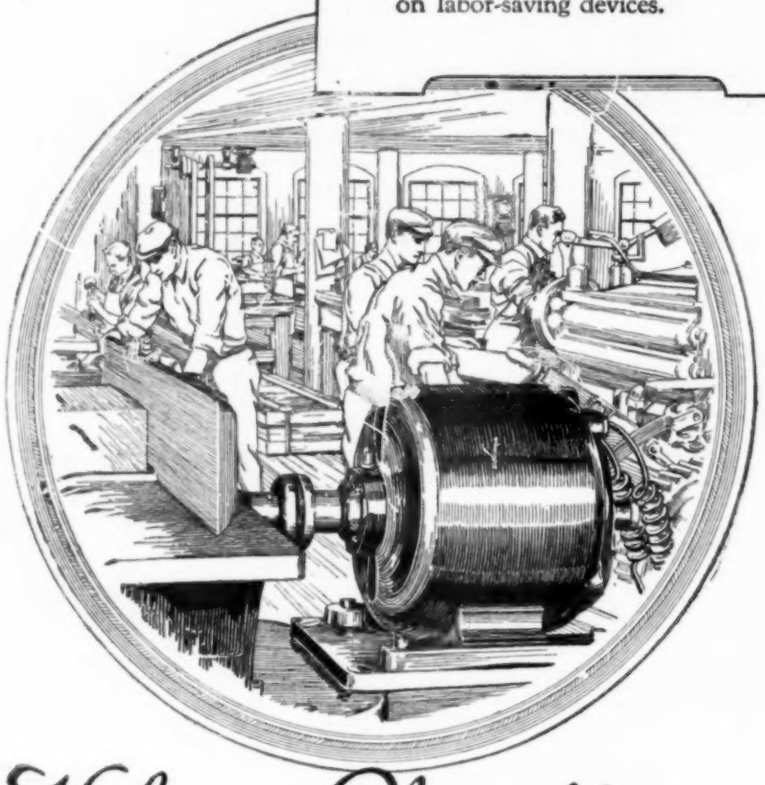
Westinghouse Single Operator Portable Arc-Welding Unit
(Note: The rheostat mounted on front of panel makes possible twenty-one different current values between the range of 50 to 225 Amperes.)

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.
Sales Offices in All Large American Cities

W
WESTINGHOUSE ELECTRIC

Westinghouse

BUILT to coördinate precisely with the work they are to do; with vibration eliminated by scientific balancing; uniform in speeds, yet adaptable to all load fluctuations; durably insulated, and amply protected from dust and moisture; made-to-order HOLTZER-CABOT electric motors assure the maximum of successful service wherever used on labor-saving devices.

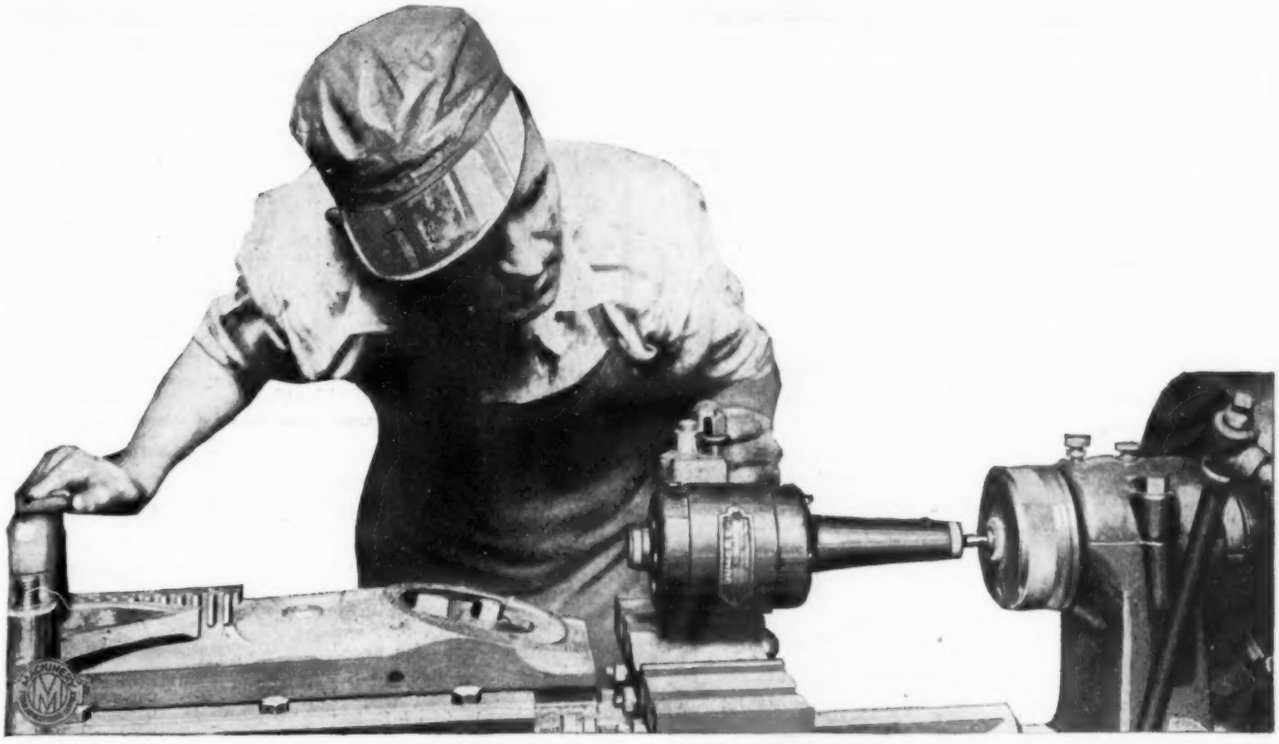


Holtzer-Cabot Motors

THE HOLTZER-CABOT ELECTRIC CO.

BOSTON, MASS.

CHICAGO
DETROIT
NEW YORK
PHILADELPHIA
MINNEAPOLIS
BALTIMORE
ST. LOUIS



Machine Tool Builders use the DUMORE

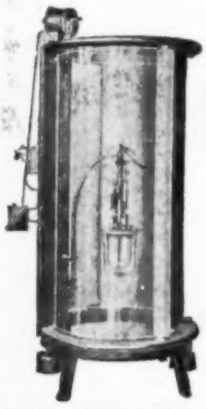
THE Wood Turret Machine Company of Brazil, Indiana, uses the **DUMORE** High Speed Grinder in many ways which readily show its real merit — in grinding the head of the Wood Tilted Turret Lathes for example, and in finishing spindle ends, etc.— the high speed of the **DUMORE** giving a result much superior to that obtained from slow speed grinders.

Here is a tool in which perfect running balance is combined with correct cutting speed. With a **DUMORE** in the shop there is no costly tearing down of jobs — no wasteful delay. It is set up easily and quickly wherever it is needed. The **DUMORE** can solve your grinding problems. It is the only tool on which you may surely rely for speed and accuracy.

Your dealer sells **DUMORE** Grinders
Ask him for a demonstration

WISCONSIN ELECTRIC COMPANY
2724 Sixteenth Street — RACINE, WISCONSIN

DUMORE HIGH SPEED GRINDERS



Electric Blue Printing Machines

Write for Catalog B-3

Buckeye Engine Co.,
Salem, Ohio

A better way to mark economically

You'll find that the Dwight Slate Marking Machines are more economical and turn out better and neater work.

It will pay you to investigate this method of improving the appearance of your product. Get the Catalog No. 10.

We also manufacture Filing Machines, Grinding and Polishing Machines and Steel Stamps, and can serve you satisfactorily on your Steel Die Engraving.

Noble & Westbrook Mfg. Co.
19 Asylum Street
Hartford Connecticut

WILEY ELECTRIC DRILL

A portable drill made to stand the strain of drilling work. They are equipped with Jacobs Chucks and are guaranteed to be perfect in construction.

Jacobs chucks used as regular equipment

Catalogue sent on request

James Clark, Jr., Electric Co., Inc.
521 W. Main Street, Louisville, Ky.

Foreign Representatives: Buck & Hickman, Ltd., London, Eng. Bevan & Edwards, Melbourne, Australia. Alfred Herbert, Ltd., Yokohama, Japan.

U. S. Electric Tools

The castings of U. S. Electrical Drills are made of aluminum. This feature together with compact construction makes U. S. Tools the most effective for every kind of service possible for portable tools. Get Catalog for full line of drills, grinders and buffers.

Write today.

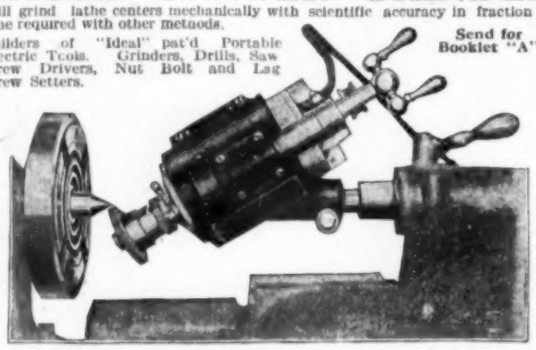
The United States Electrical Tool Co., Cincinnati, Ohio
New York Office: 50 Church St. Boston Office: 12 Pearl St.
Cleveland Office: 404 Northern National Bldg.
Chicago Office: 549 W. Washington Blvd.
St. Louis Office: 610 Commercial Bldg.
Pittsburgh Office: Bessemer Bldg.
Detroit Office: Marquette Bldg.

LATHE CENTER GRINDER

Will grind lathe centers mechanically with scientific accuracy in fraction of time required with other methods.

Builders of "Ideal" pat'd Portable Electric Tools. Grinders, Drills, Saw Screw Drivers, Nut Bolt and Lag Screw Setters.

Send for Booklet "A"

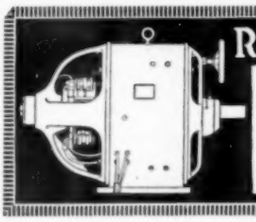


The Neil & Smith Electric Tool Co., Cincinnati, O., U. S. A.

Ransom Speed Controller

Automatically takes care of the overspeeding problem. Gives perfect control with speed variation up to 75-100%. Cannot possibly fail as long as the motor runs.

Ransom Mfg. Co., Oshkosh, Wis.



RELIANCE MOTORS

Type AS Motors give unlimited running speeds and deliver a constant horsepower output over any range up to 1 to 10.

Get Bulletin 1014 for details.

Reliance Electric & Engineering Co.
1044 Ivanhoe Rd., Cleveland, Ohio

CROCKER-WHEELER MOTORS

"Niagara's Rival for Dependable Power"

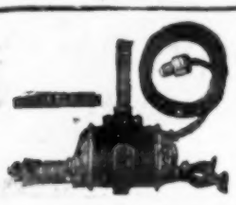
CROCKER-WHEELER CO.
Ampere, N.J.

Coil Springs for Every Requirement

Extension—Compression—Torsion—Wire Spring Special Wire Forms

Acquaint us with your problems, thereby making use of our many years of experience.

Reliance Spring & Manufacturing Co., Inc.
3909 Second Ave., Brooklyn, N. Y.

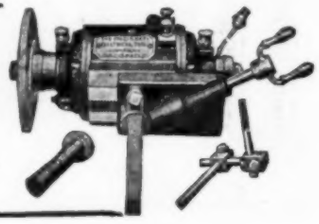


Electric Hand Drills

Made in 12 sizes, ¼ to 2 in. capacities. Hand, Screw Feed, Radials and Bench Drills, Ball and Thrust Bearings.

Tool Post Grinders

¼ to 3 H. P. Weight from 16 pounds up. Free hand feed. Bearings adjustable to wear. Horizontal and vertical feeds. Different types for all purposes. Also Bench and Floor Grinders



Cincinnati Electrical Tool Co., Cincinnati, Ohio
New York Office, 50 Church Street

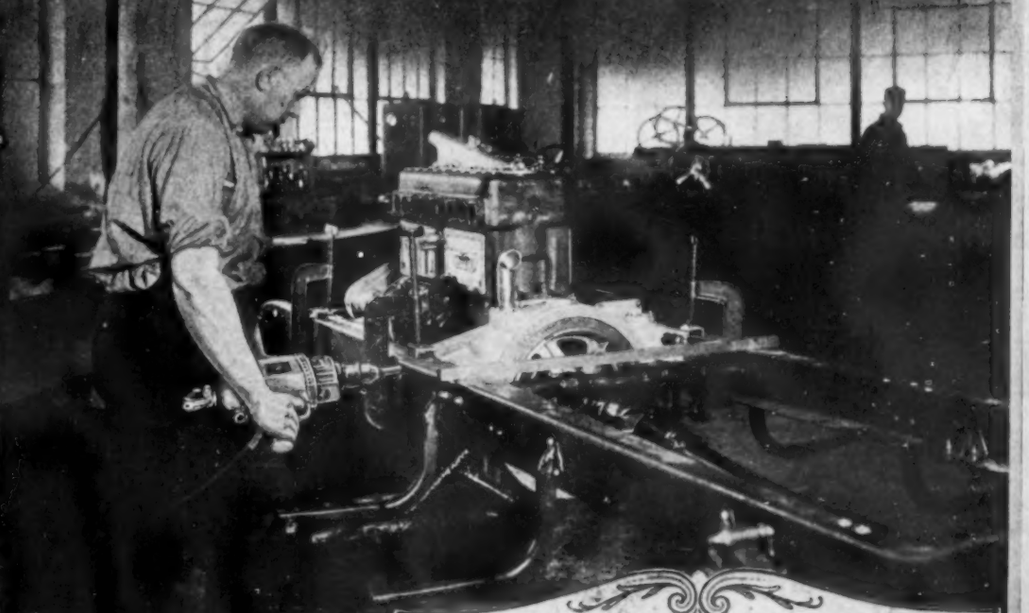
Exhibit "J"

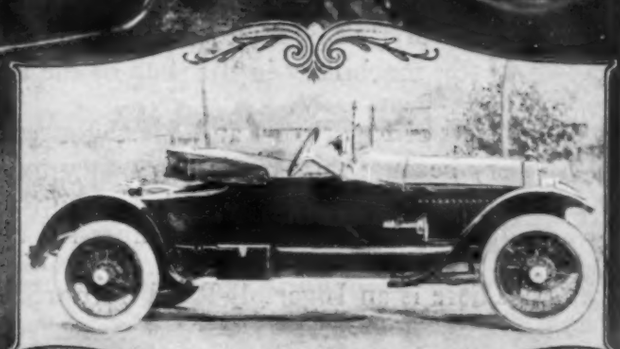
BLACK & DECKER

PORTABLE ELECTRIC DRILLS

"With the Pistol Grip and Trigger Switch"

EVIDENCE





The Stutz Motor Car Company, Indianapolis, Ind., who build cars with an international reputation, are using the Drill "With the Pistol Grip and Trigger Switch" exclusively. They have over thirty of these Drills in use in their plant at the present time.

It is not strange that quality tools should be used to produce a quality car.

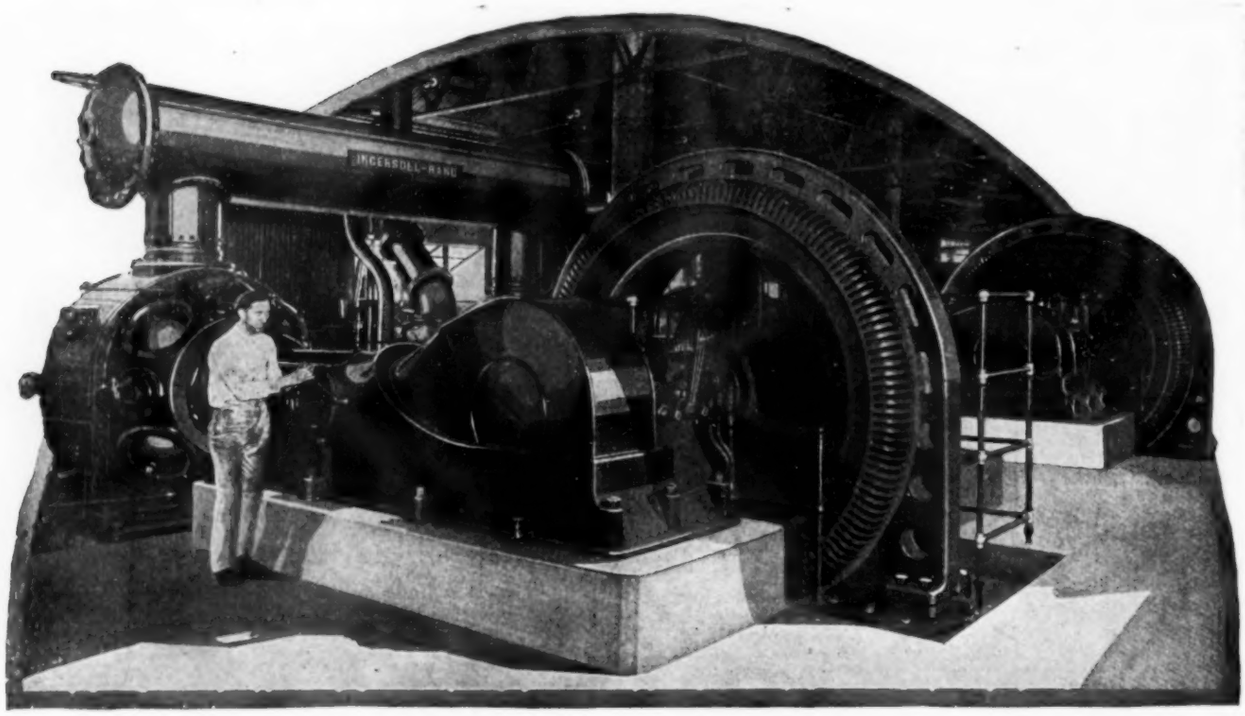
THE BLACK & DECKER MFG. CO.

TOWSON HEIGHTS, BALTIMORE, MD., U. S. A.

Portable Electric Drills Electric Valve Grinders Electric Air Compressors

BRANCH OFFICES:

New York, N.Y. Philadelphia, Pa. Atlanta, Ga. San Francisco, Cal. Chicago, Ill.
Detroit, Mich. Cleveland, Ohio Buffalo, N. Y. Boston, Mass.



Ingersoll-Rand Air Compressors

There is such a thing as justifiable pride in machinery. The designing engineer can well be proud of the results of his dreams, the mechanic of his exact and careful workmanship, and the salesman of his efforts. But the greatest pride is that of the manufacturer who places machinery in the shop of the man who is proud to own it.

Users of Ingersoll-Rand Air Compressors are proud of their machinery because they realize that they have secured the concrete results of manufacturing ideals, backed up with the service of the world's largest manufacturer of compressed air machinery.

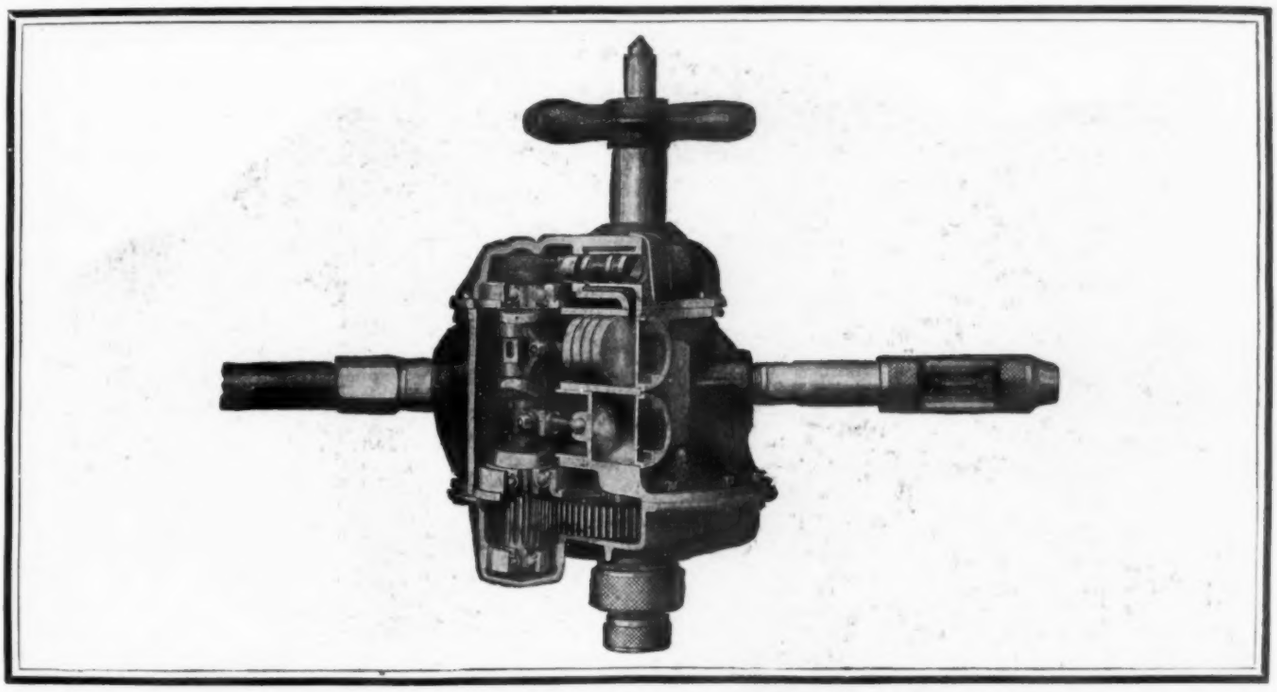
There is an Ingersoll-Rand Compressor for your needs.

The installation pictured above shows Ingersoll-Rand Class "PRE" compressors. This type has the motor direct connected to the compressor shaft. Efficient, economical regulation is accomplished by means of patented 5 step Clearance Control. Bulletin No. 3126 describes the PRE.

Ingersoll-Rand Company
11 Broadway, New York
Offices Everywhere.

444-C

Ingersoll-Rand



Under Little Giant drill housings

Seeing is believing!

Seeing—

A toggle with renewable liner suggests a saving of 86% in toggle repair costs—

A 3-point ball-bearing crank shaft suspension suggests more work-units per dollar through frictionless operation at high economy of air consumption—

Balanced piston valves, with increased area and shorter ports, suggest faster drilling by quick air admission and exhaust—

Stub-tooth gears, sturdy and compact, suggest long service and full power delivered.

And seeing Little Giants in operation is *believing* that you should make them *your* standard air drill, and that your next requisition should specify Little Giants for prompt delivery from complete stocks now carried at the Company Branches listed below.

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P-58

BOYER PNEUMATIC HAMMERS··LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
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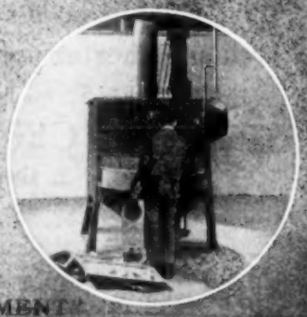

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Thor—builder of pleasure automobiles—is a pleasure builder in every automobile plant where it has been tried. Thor is a reversible or non-reversible piston air drill, light in weight but heavy in duty and wear. Thor is made in several types and sizes and equipped with pressed vanadium steel connecting rods and pistons, Corliss valves and roller bearings—a perfect air motor in both design and construction.

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spins rivets in most difficult places with utmost ease and rapidity. Every setting is perfect; no marred heads or frames.

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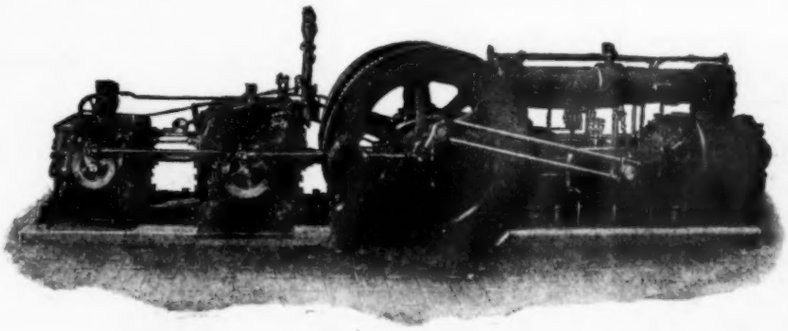

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Tandem two-stage air cylinders, and
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Unit sizes from 1,000 *feet up.*

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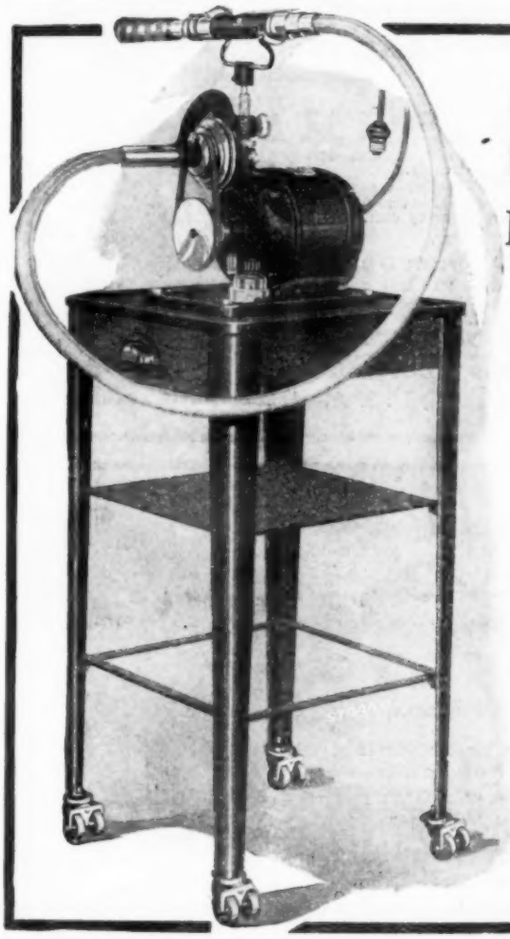

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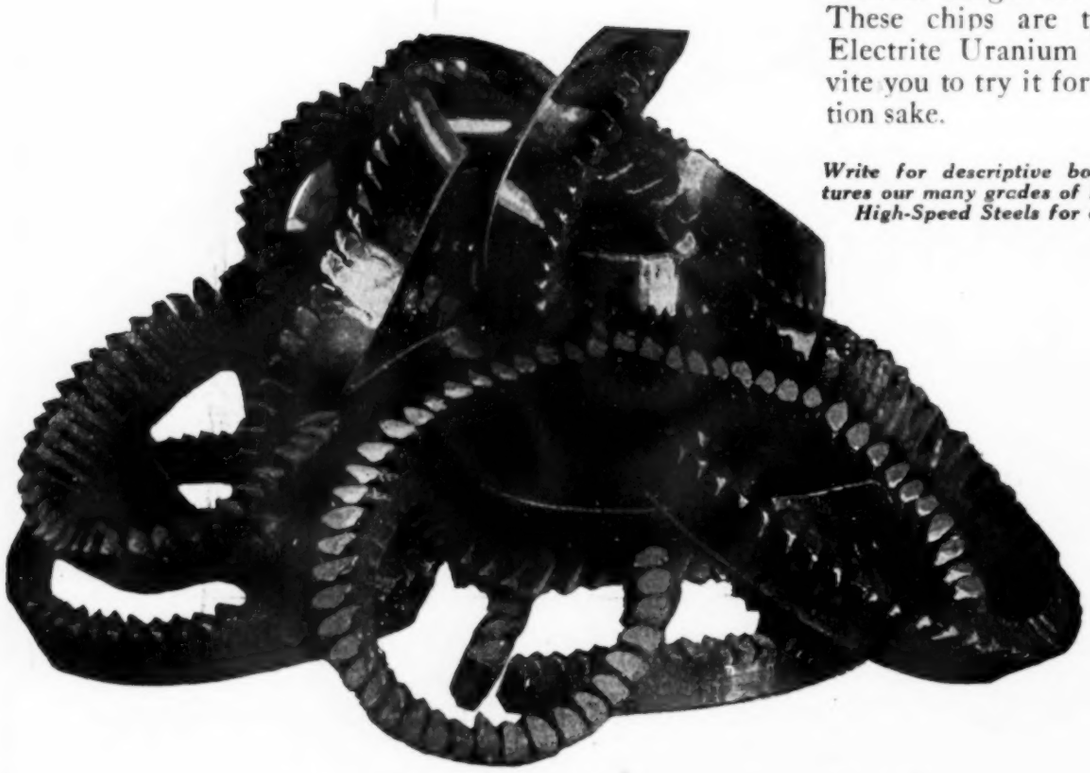
Write for descriptive booklet which features our many grades of Electrite Uranium High-Speed Steels for every purpose.



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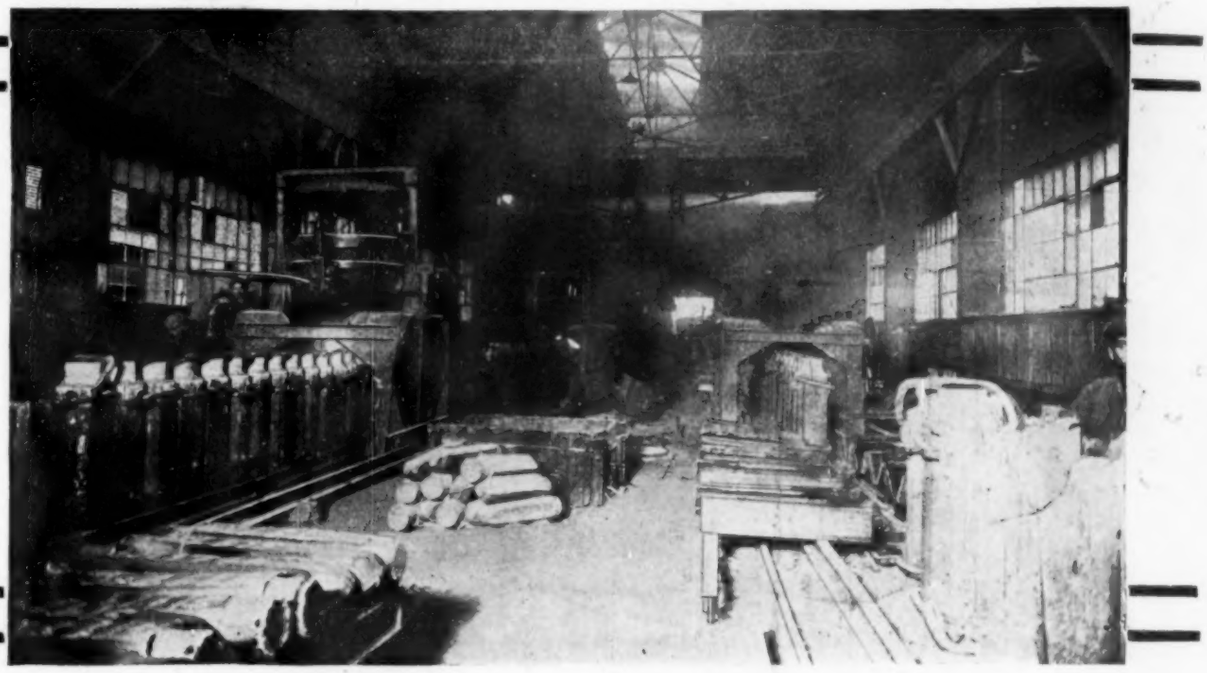

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"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

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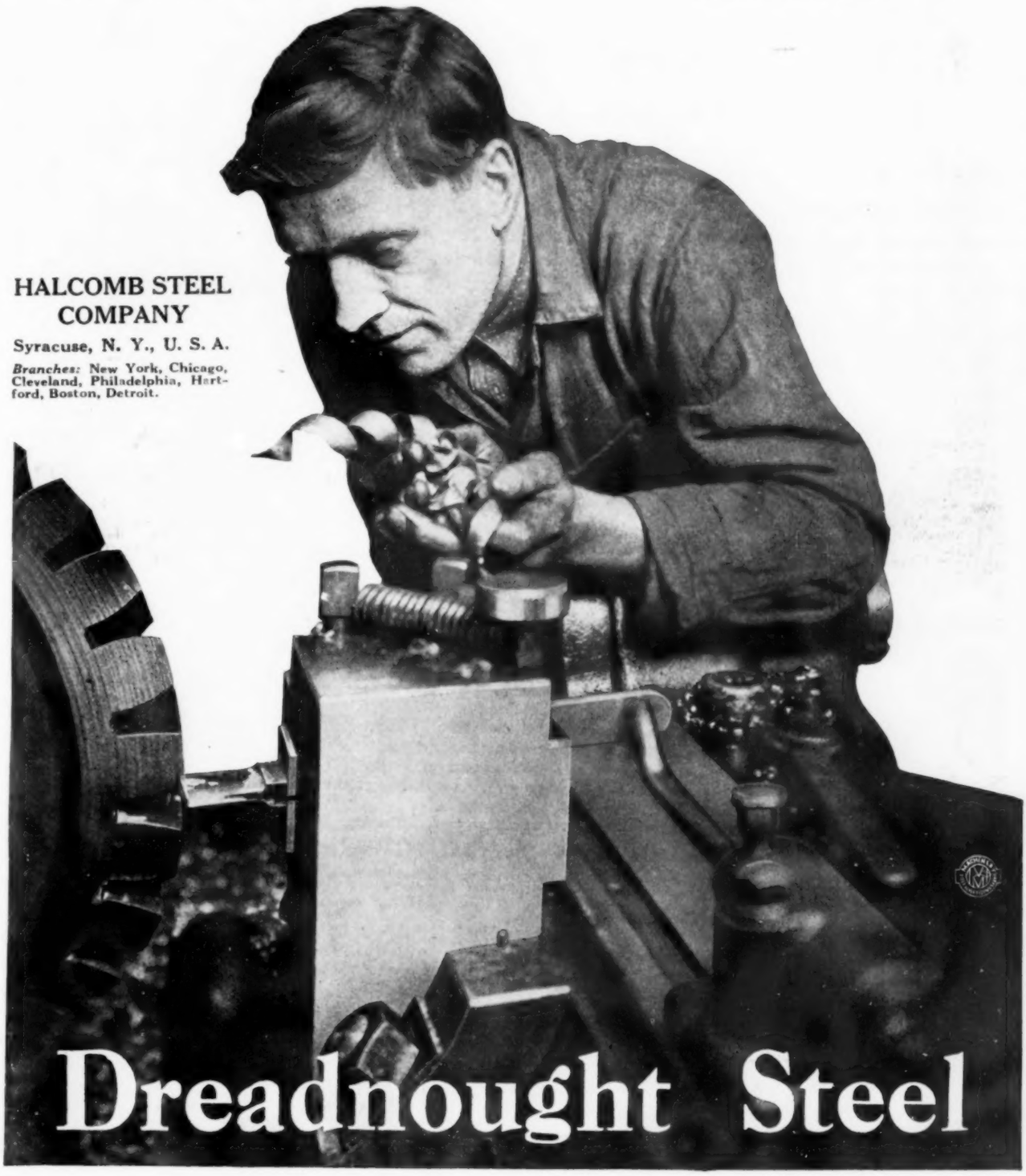
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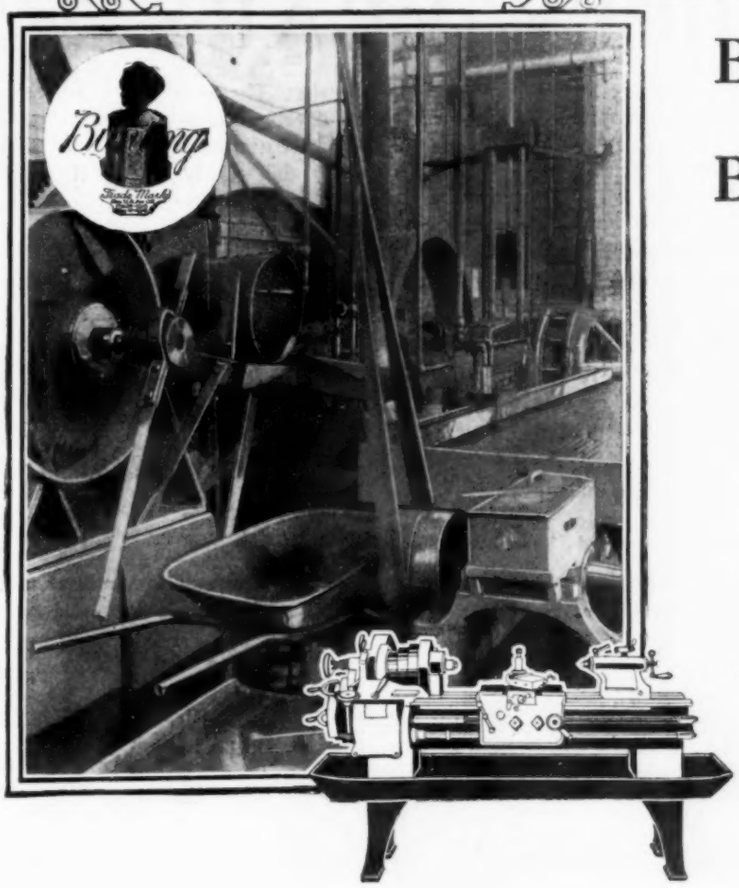

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Bunting Bushings and Bearings excel—because of the many unusual safeguards thrown about their production.

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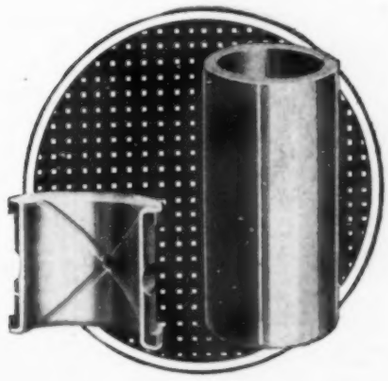

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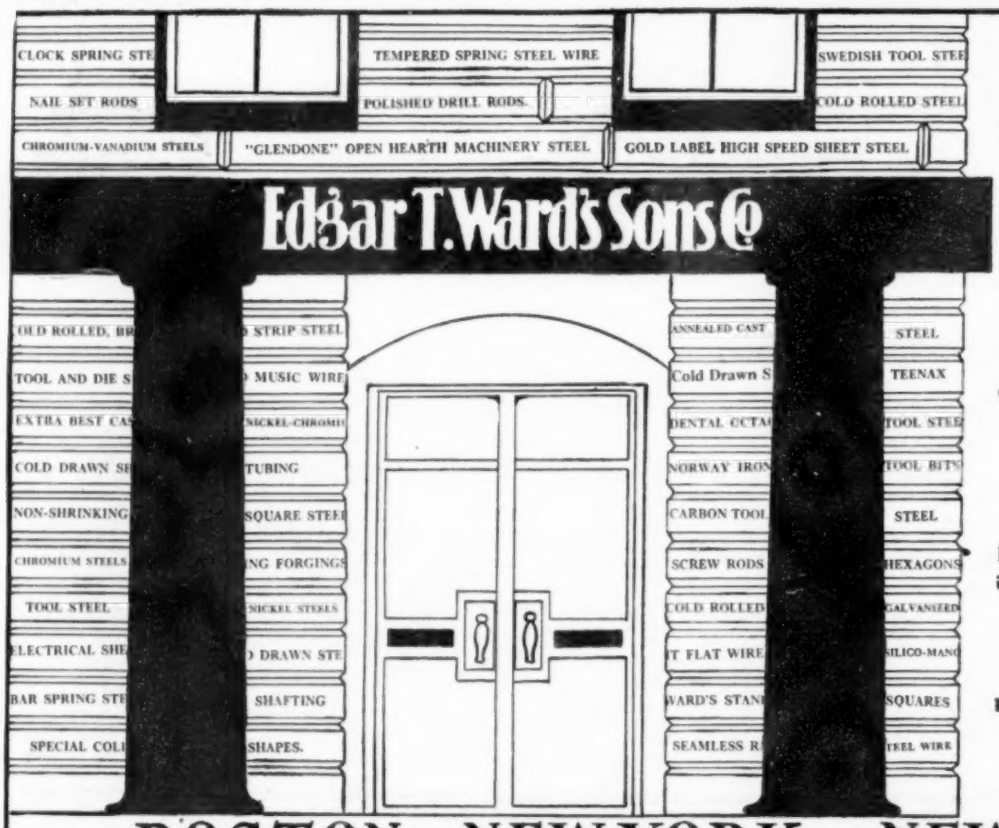

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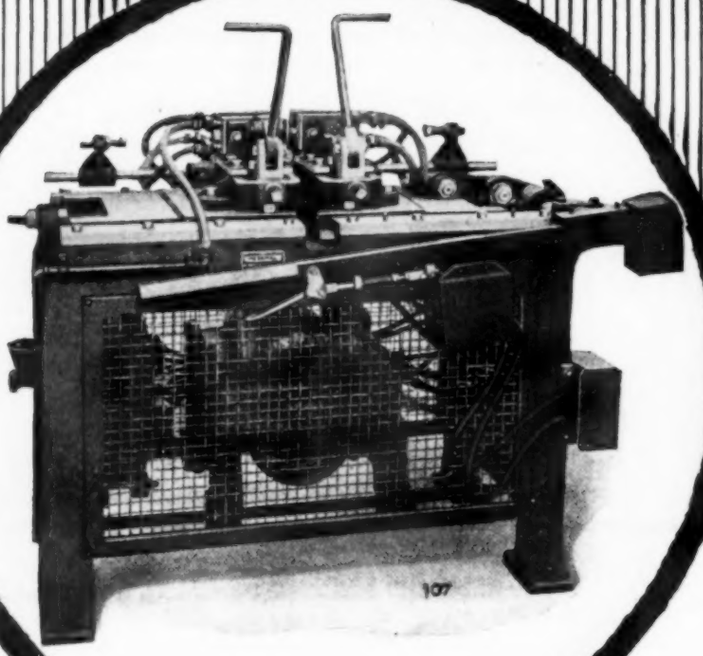

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GAS FURNACES

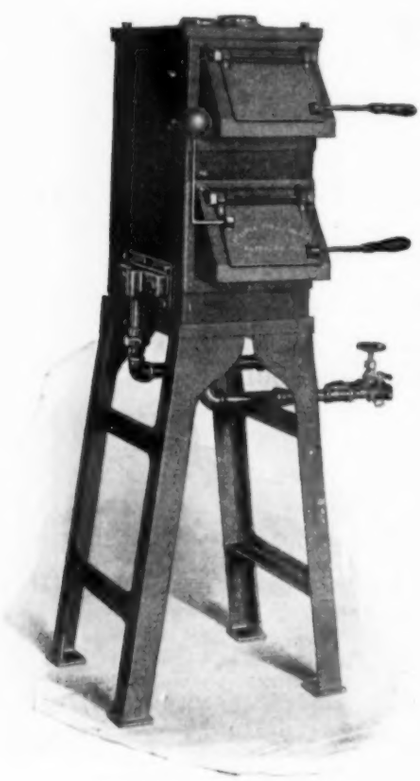
The Heat Treatment of High Carbon, or Tool Steel:

"HEATING is the most important and most difficult of all of the operations to which steel has to be subjected. Seldom is sufficient importance attached to this in Forging, Annealing and Hardening; and it is quite certain that the great variations in the endurance of Turning Tools, Dies, Punches, etc., are often due to improper treating in one of the above mentioned processes."
GARNET W. McKEE

The advantages of gas in the heat treatment of steel is clearly explained in a treatise by Garnet W. McKee, "The Heat Treatment of Steel in Gas Furnaces." This work clearly outlines the most approved methods and practices, and gives the proper heats of steel to be attained in annealing, tempering and hardening.

If this is not already in your library, we will gladly send you a copy, free of charge.

Eclipse Fuel Engineering Company
Rockford, Illinois



Eclipse No. 1 Oven Furnace with Preheating Chamber,

pecially suitable for heat treating KETOS STEEL

The upper chamber is heated by the waste gases from the lower and serves for preheating tools, etc., raising them gradually to a medium temperature preparatory to the final quick-heating in the lower oven to the high temperatures required for hardening.

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Case-Hardening Compound

Used by the country's largest consumers of this material.

Minimum weight per cubic foot —maximum penetrative power. These combined with initial cost secure economy of operation.

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Bars **Tool Bits**

A trial order will Convince You
HIGH ON SPEED
Satisfies
ONONDAGA STEEL CO., INC.
Syracuse, N. Y., U. S. A.

ARMCO IRON WELDING RODS

ARMCO IRON is the standard welding wire for both electric arc and oxy-acetylene welding. It has unequaled welding qualities, due to chemical and physical uniformity; 99.84 per cent pure iron content (minimum) guaranteed. Distributors in all industrial centers.

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SALES OFFICES: 30 Church St., New York
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San Francisco, American Rolling Mill Company of California;
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Stainless Steel

"Neither rusts, stains nor tarnishes."

The non-scaling property of Stainless Steel makes it especially suitable for many purposes in metallurgical and mechanical industries which need not be separately enumerated here.

Stainless Cutlery has been on the market for years—because it is not affected by fruit and other acids and does not rust.

Stainless Steel is already being used in very large quantities for valves of internal combustion engines which are worked at high temperatures, and for purposes requiring great strength and resistance to erosion.

Stainless has a distinct advantage over nickel steels containing a high percentage of nickel in that it can be readily softened for machining purposes, and suitably hardened afterwards.

Can be supplied in all standard sizes of round, square or flat bar steel.

American Stainless Steel Co.
1540 Oliver Bldg., Pittsburgh, Pa.

Capacity

Capacity for production—that is what sells Colonial No. 7.

Hardens and tempers like straight carbon tool steel—stronger, tougher, hardens deeper, lasts longer. Use it for production.

Colonial Steel Company

Pittsburgh Boston New Haven New York
Philadelphia Cleveland Detroit Chicago
Toledo St. Louis

You Order! We Ship! No Wait!

Cored and Solid Bars of

Williams G Bronze

Two Hundred Sizes in Stock ALWAYS!

Outside diameter from $\frac{1}{2}$ in. to 3 in., on the eighth, and from $3\frac{1}{4}$ in. to 6 in. diameter on the quarter. Proportionate cores in all sizes. Also solid, $\frac{1}{2}$ in. to 6 in. diameter. All lengths 12 in. except cored bars having $\frac{1}{2}$ in. or $\frac{5}{8}$ in. cores, which come in 6-in. lengths only.

Characteristics:

Tensile strength, 38,030 lb. per sq. in.
Permanent set under load of 5,000 lb. per sq. in. —.0001 in.
Brinell hardness—157.
Absence of blowholes—Ease of machining—Cores straight and true—Uniform grain—No hard spots.

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The FAIRBANKS Company O.K.

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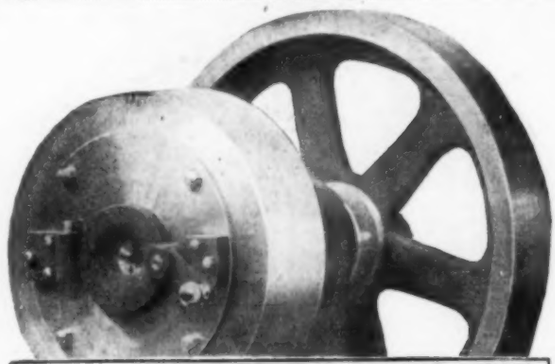
Manufactured by

E. A. Williams & Son, Inc.

103-111 Plymouth Street, Jersey City, N. J.
Makers of Bronze Castings for 63 Years



Dayton Swaging Makes It Stronger

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Our catalog is well illustrated and describes the methods and machines completely. Send for a copy.

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Coventry Swaging Co., Ltd., White Friars Lane, Coventry, England, Agents for Great Britain. Fenwick Freres & Co., 8 Rue de Roeroy, Paris, France, Italy, Belgium, Spain, Portugal and Switzerland.

Union Drawn Steel Company of Beaver Falls, Pa.

Makers of Bright Cold Finished Bessemer, Open Hearth and Crucible Steel, in Rounds, Flats, Squares, Hexagons and Special Shapes; straight, accurate to section, with polished superior wearing surface; for Shafting, Duplicate Shafts for machine construction, piston and pump rods, keys, feathers, slides, and guides; Special, simple and alloyed steels, cold finished, for all special requirements, particularly adapted for rapid machining in screw machines, hand or automatic.

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A New Gear Hobber Made Newer Still

Quick work! Saw an opportunity to further improve the gear hobber we recently put on the market. Now the remodeled new machine is ready for the market.

The latest features include:

Positive stop for setting depth of tooth to be cut.
Positive stop for bringing hob spindle to starting position.
Automatic stop for disconnecting the entire machine except the driven pulley.

You should know the rest

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Highest efficiency in results and greatest economy in operation. Both gases under independent pressure; positive mixture; high pressure torch and neutral flame. Complete Plants for greatest requirements. *Write for* Catalog, Bulletins and Supply Price List

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Seamless Steel Tubing, Cold Drawn Steel, Strip Steel, Wrought Iron Mouldings, Hot Rolled Shapes, Boiler Tubes

SISCO ALLOY MACHINERY STEEL

Extreme Strength—Excellent Machining Quality
Case Hardening and Oil Treating Tempers.

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Executive Office, Woolworth Building, New York City
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A new mixing principle, a regulator that accurately controls gases, the greatest working range ever covered by ONE torch—are exclusive IMPERIAL features. Write for catalog.
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INCO MONEL METAL

Non-corrodible—strong as steel—tough and ductile. Withstands acids, high temperatures, erosive action of hot gases and superheated steam.

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SHAFTING — SPECIAL SHAPES
New England Deliveries
NEW ENGLAND DRAWN STEEL CO.
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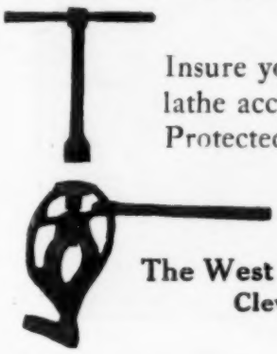
West's Protected Lathe Dog



Insure your workmen against lathe accidents—order West's Protected Lathe Dogs.

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Cleveland, Ohio

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MANUFACTURERS of STRIP STEEL
HOT and COLD ROLLED

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Aluminum Oxide Abrasive of remarkable quality. Invented and developed by Mr. René Bouvier, noted French Engineer.

The outstanding qualities of Bathite are: Greater specific gravity than other abrasives; superior hardness, but more especially of greater toughness and strength, permitting a forcing into the cut, with faster work. Large crystals and splendid angles of fracture.

We can supply it in assorted grains, or in crude shape as it comes from the electric furnaces in France.

Wish to hear from large users of abrasives. We will not sell for wheel-making purposes.

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HIGH SPEED STEEL

WORKS—MONONGAHELA CITY, PA.

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Learn the sure, permanent way to stop leaks of steam, water, oil, gas or air in pipes, boilers, tanks, etc., with

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WOLFRAM HIGH SPEED STEEL

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These two brands of TOOL STEEL are noted for their UNIFORMITY for Turning, Slotting, Planing, MILLING CUTTERS, FORMING TOOLS, Reamers, Broaches, Taps and Punches, Dies, etc. A large and varied stock of BARS and SHEETS for all purposes on hand. PIVOT or SCALE STEEL, DRILL ROD.

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Strong, durable and uniformly satisfactory, forged gear blanks are more dependable than castings, often less expensive and always more economical in the long run.

We are supplying forged gear blanks, lead screw blanks, etc., to prominent manufacturers in all mechanical lines. Repeat orders and a steadily growing list of customers are our best recommendation.

We make prompt deliveries — size, stock and quantities to meet any requirements. Let us estimate.

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Hamilton Ave. and Marquette St.
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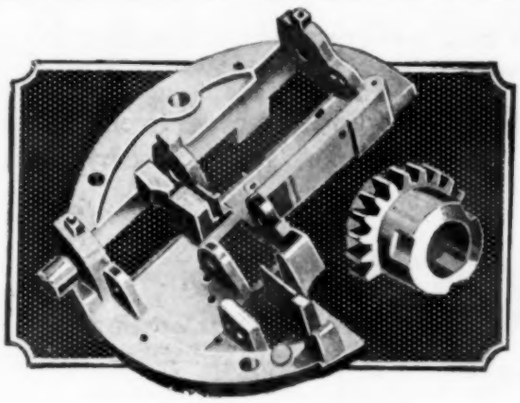

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The experience of thousands of users has proven that Doehler Die-Castings can always be depended upon to measure up to an exacting standard. They are designed and made by men who are expert through years of specialization.

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THE WORLD'S LARGEST MANUFACTURERS OF DIE CASTINGS
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Bronze Bushings

Made to your formula. Machined to your specifications. Brass and Bronze Castings. Special Machine Work.

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Used in Practically all Branches of Manufacture

Franklin Die-Castings in Aluminum, Tin, Lead, and Zinc base alloys are as accurate as machined parts, but cheaper, and made with greater speed and uniformity.

Estimates given from samples, drawings, or blueprints

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How much do you spend on Engraved Plates?

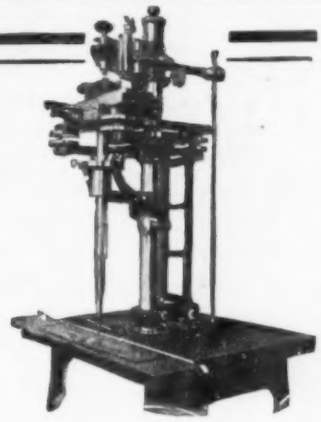
Unless you use a modern engraving machine you probably spend too much for your engraving work.

The range of work within the limits of Gorton Engraving Machines is surprisingly large to one who has not seen the variety and quality of the engraving produced.

To demonstrate the economy of Gorton Machines, we will be pleased to submit sample plates and accurate cost data on *your* class of engraving.

Geo. Gorton Machine Co.
Racine, Wis.

Engrave It Yourself



Why do you send outside for your engraving jobs when you can have them done right in your own plant for less cost?

Here's an engraving machine of the routing type having a rapidly revolving cutter driven by a small electric motor. It is designed for accurate, rapid and economic engraving of brass, steel and other metals.

If you have engraving to do it will pay you to investigate our proposition. Complete details will gladly be sent upon request.

Engravers & Printers Mach. Co.
Sag Harbor, New York

DIE-CAST PARTS AND BEARINGS

made from our various alloys of

ZINC, TIN, LEAD AND ALUMINUM

NATIONAL LEAD COMPANY
111 Broadway New York, N. Y.

Tuttle Tappers

No. 1 Machine for Hand Lever Operation

Pressure on the chuck spindle starts the "Tuttle"; pressure on the lever stops it.

When the depth for which the machine is set is reached, the "Tuttle" automatically stops the travel of tap and saves spoiled work and broken taps.

The operations are simple, but they were never worked out before.

There are two Tuttle Tappers: No. 1 for hand lever operation. No. 2 for foot lever operation. Illustration shows No. 1 machine.

Write for Booklet showing both styles.

EVANS STAMPING & PLATING CO., Taunton, Mass.

"Quality" DIE CASTINGS

LMF CO
LIGHT MFG. & FOUNDRY CO.
Pottstown, Pa., U. S. A.

Multigraduated Precision Grinder

for thread grinding

Accurate, Rapid, Economical, price within the reach of any shop.
"DUPLEX THREAD GRINDER"
Trade Mark
for production grinding of threads.
Patented in the United States May 11, 1920
Foreign Patent Claims Allowed
PRECISION & THREAD GRINDER MFG. CO.
Mfg. Plant and Offices: 1932-4 Arch St., Philadelphia, Pa.

Kreodone EVERLASTING WOOD BLOCK FLOORS

Everlasting because they are treated with PURE CREOSOTE OIL. Let us tell you why Kreodone Creosote Oil is free from adulteration.

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Plants: Indianapolis Minneapolis Mobile Seattle Norfolk
See our full page next week.

Prosperity Producers

HEAT TREATING is one of the most important things in manufacturing today. It makes or mars the finished product, to say nothing of the danger of adding unnecessarily to the already heavy cost of material and labor.

Imperfections or breakages of high-grade tools, gears or machine parts may hold up the continuous production of a department or perhaps an entire factory. Uncertain heat treating results make such a possibility more than likely.

High quality products—the kind that put their makers in the prosperity column—are sure and certain only in *guaranteed* furnaces—furnaces that are *built right*, combining science and practical experience in such a way that results are *accurate*.

Stewart Furnaces are *prosperity producers*—delivering guaranteed, superior results with minimum cost of material, fuel and labor. Stewart users are satisfied users—continuous service and additional installations are evidence of their reliability and popularity.

Let Stewarts help produce prosperity for you—they have helped many a manufacturer establish and maintain a reputation for high quality production.

Catalog No. 75 describes Stewart heat treating equipment in detail. You should have a copy handy.

Chicago Flexible Shaft Company

1156 S. Central Ave., Chicago
New York Office, 350 Broadway

Stewart No. 0 Crucible Furnace

Pressed steel pot, 6" diam., 12" depth
Floor space, 26" x 26"
Gas and air connections, 1"
Shipping weight, 590 lbs.
For gas or oil fuel
Hood for lead or cyanide hardening, extra charge

Stewart No. 25 Oven Furnace

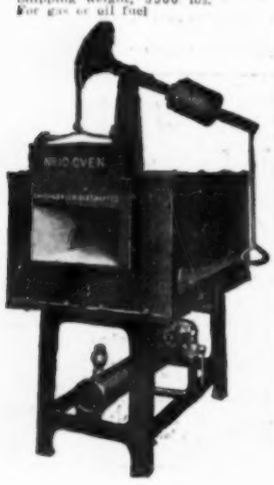
For Carbonizing, Heat Treating and Annealing.

Opening, 14" x 22"
Depth, 60"
Floor space, 50" x 74"
Gas and air connections, 1½"
Shipping weight, 7000 lbs.
For gas or oil fuel.

Stewart No. 10 Oven Furnace

For Heat Treating, Annealing and Carbonizing.

Opening, 12" x 20"
Depth, 48"
Floor space, 42" x 66"
Gas and air connections, 1½"
Shipping weight, 3900 lbs.
For gas or oil fuel



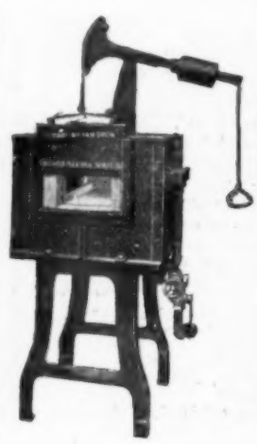
Stewart No. 1 Oven Furnace

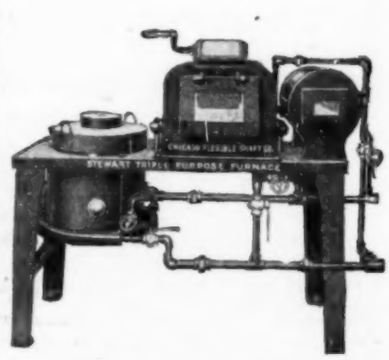
For Hardening High Speed and Carbon Steel, or for Annealing and Carbonizing.

Opening, 5" x 9"
Depth, 13½"
Floor space, 28" x 28"
Gas and air connections, 1¼"
Shipping weight, 1000 lbs.
For gas or fuel

Stewart No. 14H Oven Furnace for High Speed Steel

Opening, 6" x 10"
Depth, 15"
Floor space, 36" x 36"
Gas and air connections, 1¼"
Shipping weight, 1450 lbs.
For gas fuel only



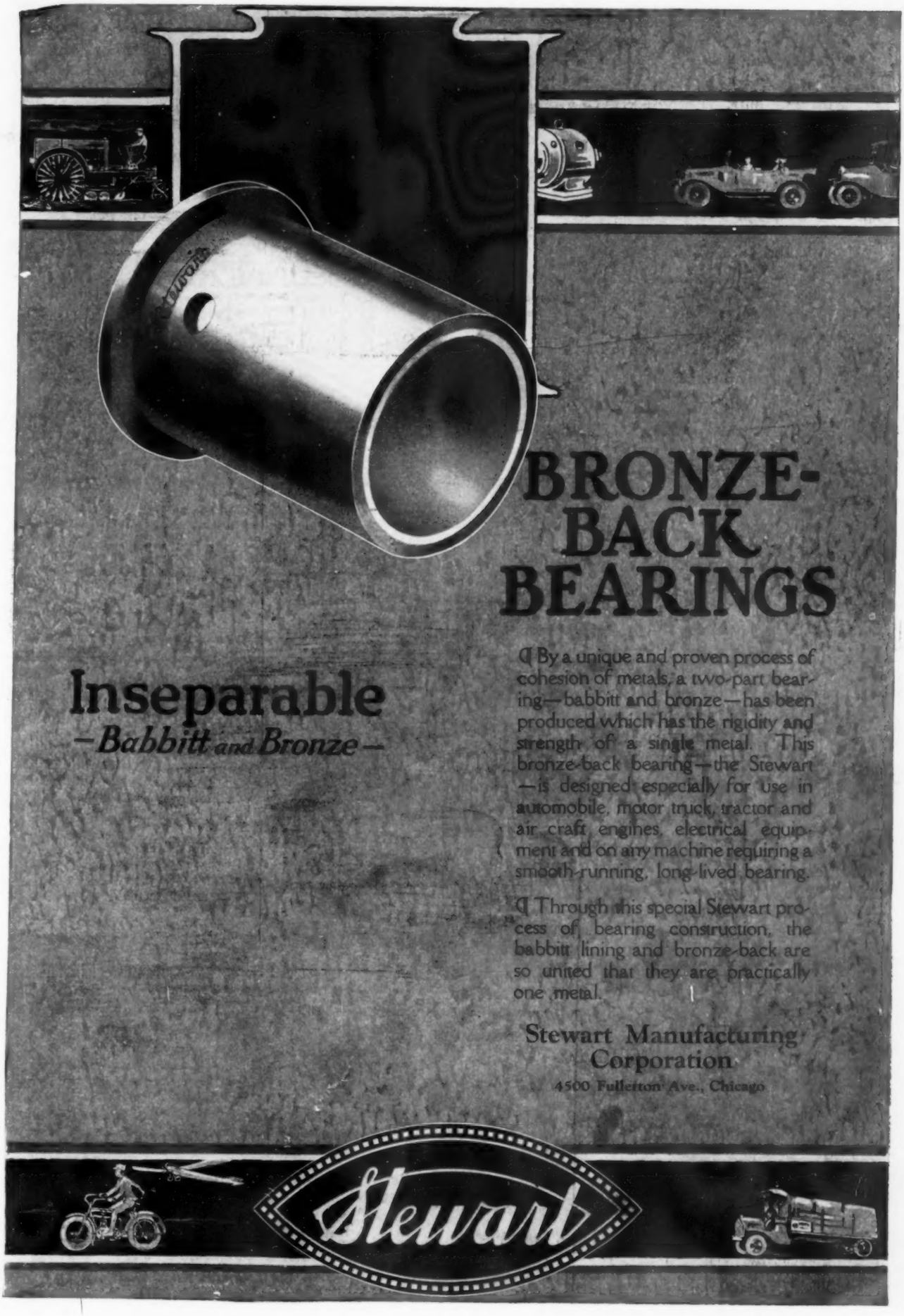


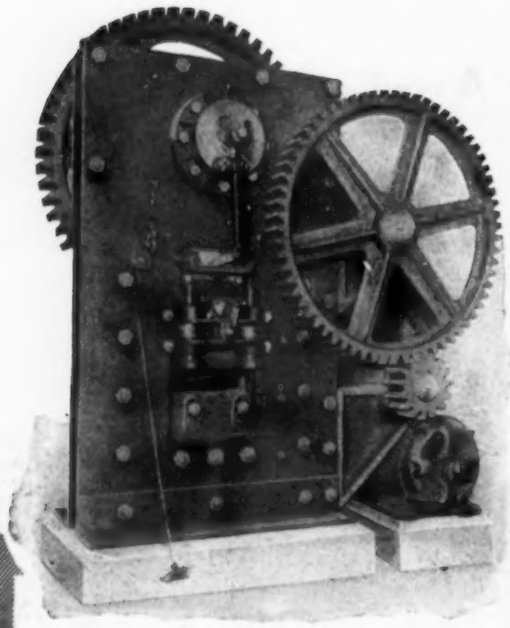
Stewart Triple Purpose Furnace

A complete, convenient, compact plant covering practically the whole range of heat treatment of metals.

Stewart No. 28 Oven Furnace, Stewart No. 3 High Speed Steel Furnace and Stewart No. 12 Barium Chloride Furnace—all on one base.

Units may be operated singly, or any two at a time. All units capable of high temperatures required for high speed steel hardening.


BRONZE-BACK BEARINGS
Inseparable
—Babbitt and Bronze—
¶ By a unique and proven process of cohesion of metals, a two-part bearing—babbitt and bronze—has been produced which has the rigidity and strength of a single metal. This bronze-back bearing—the Stewart—is designed especially for use in automobile, motor truck, tractor and air craft engines, electrical equipment and on any machine requiring a smooth-running, long-lived bearing.
¶ Through this special Stewart process of bearing construction, the babbitt lining and bronze-back are so united that they are practically one metal.
Stewart Manufacturing Corporation
4500 Fullerton Ave., Chicago
Stewart



BUFFALO "Armor Plate" steel is a tough unbreakable material with a tensile strength of 75,000 lb. per square inch—*seven and one-half times* as strong as cast-iron.

Applied to construction of Buffalo Punches, Shears and Bar Cutters, these plates produce a frame that will neither bend, spring nor break. Moreover, Buffalo machines are only one-third as heavy as cast-iron machines of equal capacity.

Be sure, before equipping your shop with heavy duty metal cutting machinery, to investigate Buffalos.

Write for Catalog
P/S. Department 51

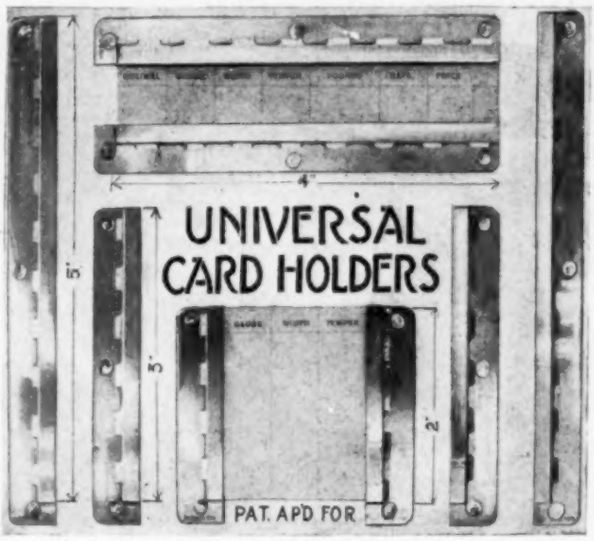
BUFFALO FORGE CO.
BUFFALO, N. Y., U. S. A.

Offices in All Principal Cities

"Buffalo"

No Waste of Steel in Making the "Universal" Card Holders

Now you can label your stock bins, shelves, trucks, stock boxes, etc., with any size label you wish.
We carry four sizes in stock 2 in., 3 in., 4 in. and 5 in., other sizes to order.



Some Advantages:

One size holder can be used for **various size** cards, can be used either in a **vertical** or **horizontal** position, can be manufactured at a **small cost** hence **LOW PRICE.** Take up but **little room** in transit or store room. Permits the use of nearly the **entire card.** Card can easily be **put in** or **taken out.**

Samples and price list on request.

DETROIT STAMPING COMPANY
(Makers of the Milling Machine Arbor Spacer)
951-957 West Fort Street, Detroit, Michigan

For Better Tools and Cutters

The Woods No. 2 Universal Tool and Cutter Grinder is a tool room necessity.

Some of its features are wide range, large bearings, convenient adjustments, heavy design, rigid construction, economy of operation and fast production. Does it interest you?

Write for complete information on Universal Tool and Cutter Grinders

The Woods Engineering Co.
Alliance, Ohio

Special Heat Enduring Boxes

ANNEALING
CARBONIZING

Use These and Save Expense

GARWOOD BRONZE & IRON WORKS, Garwood, N. J.

There is nothing better than the Best

To secure 100% Economy and 100% Efficiency, use W. N. Best oil and tar burners and furnaces for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc. Send for Catalog.

"There is nothing better than the Best"

W. N. BEST, Inc., 11 Broadway, N. Y. City

How to be Sure—

Buy Steel Under Analysis Heat-Treat it in an

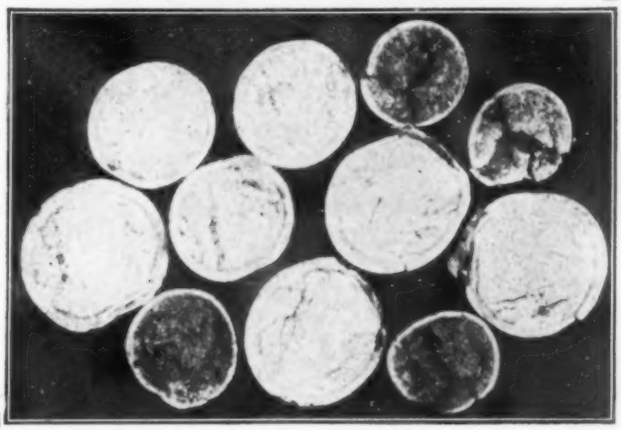
American Gas Furnace

Figures can't lie, if the figures are right. We know our figures are correct when we guarantee that if you buy steel under analysis and treat it in "American" Gas Furnaces, there will be no guess-work about the results.

Your products will be carbonized, annealed or case-hardened uniformly—exactly as you want them—for the temperature can be controlled automatically to within 10° Fahrenheit. With the use of our Automatic Heat Controller and Regulator we guarantee uniform temperatures under control to within 10° Fahrenheit automatically.

Our reputation as pioneers in the development of gas as the scientific heat-treating medium is back of our line, including: Pressure Blowers, Gas Blast Furnaces, Heating Machines, Blow Pipes and Burners, Case Hardening Machines, Rotary Annealing Machines with Sealed Retort, Coloring and Tempering Machines

Samples of Work — Case Hardened by Gas



American Gas Furnace Company
Gas Engineers and Manufacturers
24 and 26 John Street, New York City

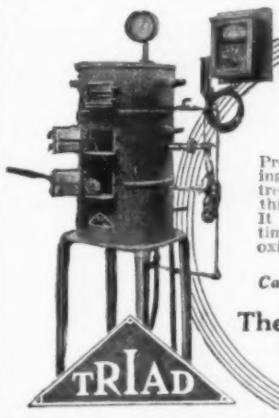
How do you melt your babbitt or other soft metal?

The Johnson No. 8 Torch will successfully do this work at minimum cost. It is equipped with a 6-in. pot and holds 20 lb. of soft metal. 2250 deg. F. Flame Temperature Without Forced Air Blast or Blower.

Write for Catalog.

CEDAR RAPIDS, IOWA, U.S.A. JOHNSON DIRECT JET PATENTED 1908

Appliances and Method Protected by U. S. and Foreign Patents.
Johnson Gas Appliance Co., Cedar Rapids, Iowa



The 3 Purpose Furnace

Preheating, Hardening, Tempering—you can perform all three treatments with one burner with this economy furnace—the Triad. It saves fuel, floor space, labor, time and avoids the danger of oxidizing tools under treatment.

Catalog 10 gives full particulars

The W. R. Bennett Co.
1045 New Britain Ave.
Elmwood, Conn.

TRIAD

FURNACES—

From the smallest tool room equipment to the largest continuous billet furnaces used in the Steel Mills. Tate-Jones engineers can solve your furnace problems and supply you efficient and correct equipment for your work. Oil, coal or gas fuel.

Write for booklet "Heat Treatment of Steel"

Tate Jones & Co. Inc.
Pittsburgh, Penna.

T-J TRADE MARK Reg U.S. Pat Off

Clean Your Newly Made Nuts, Screws, Bolts, Etc.,

in one of our Soda and Potash Kettles. It's the quickest and most economical way of washing all newly made machine parts, removing oil, grease, chips, etc. Also convenient for getting paint, dirt, etc., from machinery, automobile parts, etc., which are being overhauled and repaired.

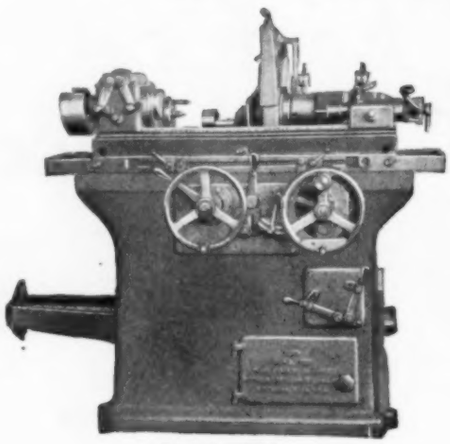
Write for Circular.

The Gray & Prior Machine Company
69 Suffield St., Hartford, Conn., U.S.A.

FITCHBURG

MODEL "A" 4 x 20

Plain Cylindrical Grinding Machine



CAPACITY:
Center swing 4-in. in dia.
Centers take 20-in. in length.
Feeds Automatic.

Specifications:

Swivel plate graduated to angle of.....10 deg.
Work centers, No. 3 Morse Taper.....15/16 in. dia.
Grinding wheel spindle front bearing..2¼ in. dia., 5⅝ in. long
Grinding wheel spindle rear bearing..2⅛ in. dia., 5⅝ in. long
Grinding wheel spindle pulley.....5 in. dia., 2⅞ in. face
Size of grinding wheel..14 in. dia., 1 in. to 2 in. face, 5 in. hole
Number of grinding wheel speeds..2—1610 and 1890 R.P.M.
Number of work speeds.....4—81 to 432 R.P.M.
Number of table feeds.....4—28 to 150 per minute
Tight and loose pulley on countershaft..10 in. dia., 4¼ in. face
Speed of ball bearing countershaft.....700 R.P.M.
Floor space at right angles to spindle.....49 in.
Floor space parallel to spindle.....80 in.
Net weight, about .....3,000 lbs.
Gross weight, crated.....3,500 lbs.

FITCHBURG GRINDING MACHINE CO.

FITCHBURG Mass., U. S. A.

ABRASIVE Surface Grinders

A Surface grinder of most modern construction.

B uilt with a one-piece cast frame, which

R educes the tendency to vibrate.

A ll controlling hand wheels and levers are located in convenient positions and

S. K. F. ball bearings are used on all high speed bearings.

I t is also equipped with an accelerating device for rapid vertical adjustments and

V ery best phosphor bronze boxes are used on the wheel spindle.

E xcellent workmanship throughout, our bulletin describes it in detail.

THE ABRASIVE MACHINE TOOL CO.
PROVIDENCE, R.I. U.S.A.

BATH

Universal Grinding Machine

For cylindrical, surface, internal, tool and cutter grinding

Made in 3 sizes

No. 1—10-in. Swing, 20 in. between centers, wheel 10 x ¾.

No. 2—10-in. swing, 25 in. between centers, wheel 12 x 1½.

No. 2½—10-in. swing, 36 in. between centers, wheel 12 x 1½.

Built by

Universal Grinding Machine Co.

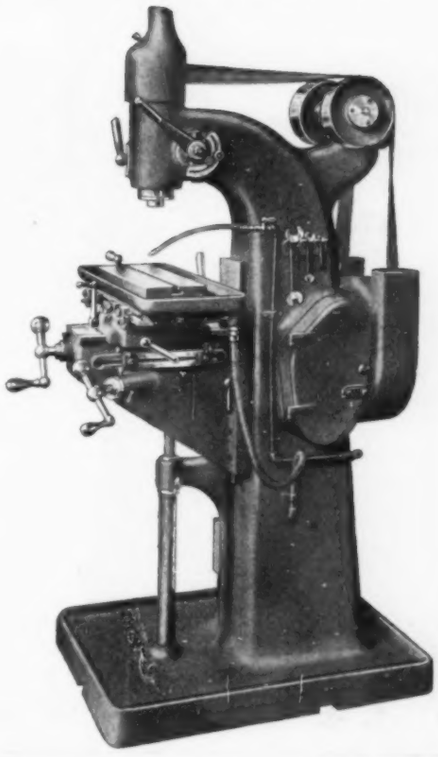
Fitchburg, Mass., U. S. A.

AGENTS: The Fairbanks Co., New York City, Albany, Syracuse, Utica, Buffalo, Boston, Hartford, Newark, Philadelphia, Scranton, Baltimore, Birmingham, Ala., New Orleans, Chicago, Ill., and St. Louis. The Wolverine Mchy. and Supply Co., Detroit. The W. M. Pattison Supply Co., Cleveland. The National Supply Co., Toledo. Laughlin Barney, Pittsburgh. Brownell Mchy. Co., Providence. Hallidie Machinery Co., Seattle. W. H. Savage, Fitchburg. Alfred Herbert, Ltd., Great Britain, Japan, Australia. George E. Fogarty, Paris. Oscar Ericsson, Copenhagen. American Machinery Syndicate, Spain. R. S. Stokvis & Zonen, Holland.

Vertical Milling of Small Work

such as closed end slots in shafts and bushings, circular cuts, oil grooves, tee slots, dovetailing in chuck bodies and jaws, connecting rod panels, face milling, die work, jigs, fixtures, etc., requiring the use of cutters 1/16 in. to ⅞ in. diameter, is quickly and accurately accomplished on this VERTICAL MILLING MACHINE.

BECAUSE of its staunchness, ease in operating and flexibility of speeds and feeds, cutters can be run at their correct periphery cutting speed and the proper relation of the speed of the cutter to the travel of the table may be quickly obtained.



Circular contains Table of Periphery Cutting Speeds of Cutters in feet per minute and revolutions per minute, also Change Gear Chart of Spindle Speeds and Table Feed.

The Taylor & Fenn Company
Hartford, Conn., U. S. A.

They're Made To Stand The Gaff

Superior Grinding Wheels are made principally from Corundum, a natural ore next to the diamond in hardness. Thus, Superiors are ideal wheels for all classes of steel grinding.

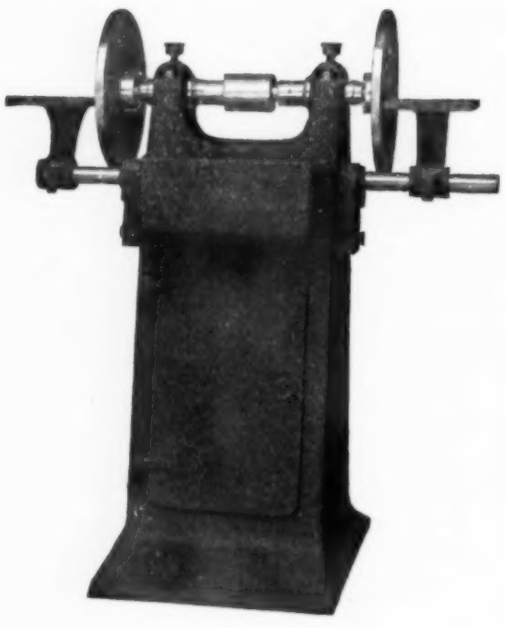
Certain classes of grinding require other abrasives; so by using Emery, Carbosolite and Adamite in addition to Corundum we guarantee to furnish the proper wheel for any kind of grinding.

We carry in stock all sizes and shapes for all cutter grinding.

Investigate Superior before deciding

Superior Corundum Wheel Co., Waltham, Mass., U. S. A.

Antigo Disc Grinding Machines



There's Nothing To 'Em

We admit it—there is no more to the Antigo Disc Grinding Machine than a solid, well-proportioned base, a strong spindle of high carbon steel, turned and ground, and a pair of steel discs, accurate to a tolerance of .001.

There are no unnecessary parts to get out of order on the No. 1 Antigo Disc Grinder; there is nothing, aside from the discs, to absorb the pull on the spindle.

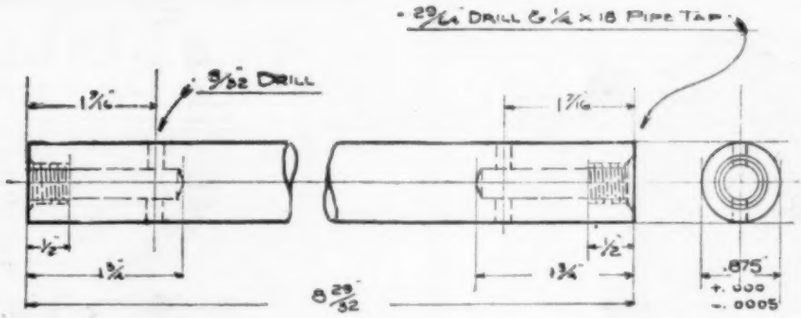
Thus you get the very maximum of power applied to the work.

Antigo Disc Grinding Machines are made in several different styles and sizes, suitable for all classes of work.

Literature on Request

MURRAY-MYLREA MACHINE CO.
Antigo, Wisconsin

Agent: J. C. Austerberry, 65 Shelby Street, Detroit, Mich.



The illustration shows the idler pulley shaft used to carry the roller bearings on the GRANT NOISELESS RIVET SPINNING MACHINE. The amount of stock removed in grinding is .025 inches and they are ground complete at the rate of forty per hour on the

Sanford Precision Centerless Cylindrical Grinding Machine

It will do as well on your work

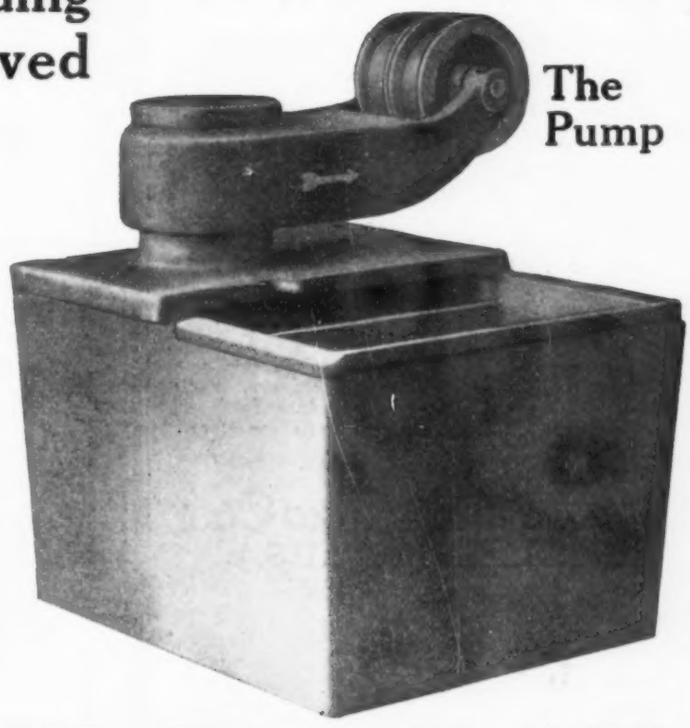
Russell Holbrook & Henderson, Inc.
30 Church Street, New York

The Heat of Grinding Effectively Removed

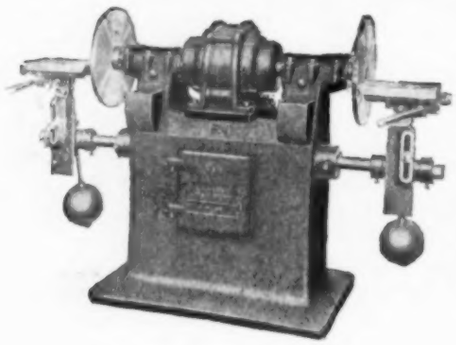
This Oakley Pump recently designed, adds the finishing efficiency touch to the Oakley No. 2 Universal Cutter and Tool Grinder; a machine which is universally recognized as being practically indispensable for modern toolrooms.

A strong, steady stream of cooling fluid is caused to flow continuously over the work, preventing any possibility of overheating. This pump can also be furnished for other tools.

Write for our catalog and see how you can end your grinder troubles.



The Oakley Machine Tool Co., Cincinnati, Ohio, U. S. A.



Motor Driven Disc Grinder

It Satisfies the Demand for a Machine Tool of High Quality

The Diamond Machine Company was one of the pioneers in the grinding machinery field and the machine illustrated above is the product of a development extending over a period of close on to half a century. Those who know specify

DIAMOND
GRINDING & POLISHING MACHINES

They are preferred by experienced machinists, because they are a known quantity in performance and enduring service. They were pioneers in their field and have survived and shown the way in development for the last fifty years, because they are the product of a firm with a CENTURY OF EXPERIENCE in the metal trades behind it.

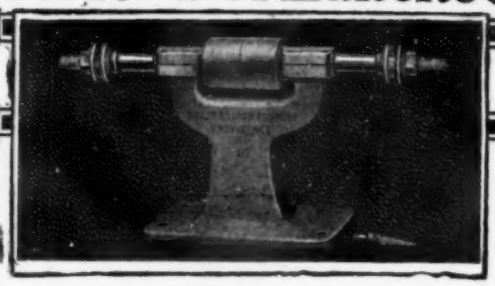
Ask the Old Fellows in the Shop

Probably your dealer has our catalogues on Floor Grinding and Polishing Machinery, Wet Tool Grinders, Disc and Ring Grinders, Surface Grinders, or Face Grinders, or write direct to

Diamond Machine Co.
Providence, R.I., U.S.A.

EXCLUSIVE AGENTS: Strong, Carlisle & Hammond Cleveland, Ohio; E. A. Kinsey Co., Cincinnati, Ohio; National Tool & Supply Co., Toledo, Ohio; Chas. A. Strelinger Co., Detroit, Mich.; E. L. Essley Machinery Co., Chicago, Moline, Ill., and Milwaukee, Wis.; Somers, Fitler & Todd Co., Pittsburgh, Pa.; Vonnegut Machinery Co., Indianapolis, Ind.; Williams & Wilson, Ltd., Montreal, Que., Canada; Chas. Churchill & Co., Ltd., London, England; Fenwick Freres & Co., Paris, France. Agents for Belgium, France, Switzerland, Italy, Spain and Portugal; The Horne Co., Ltd., Tokio, Japan.

Buy BUILDERS- for Permanence



What "Builders" Means

The manufacturers of "Builders" Grinders and Polishers were established in 1820—experience and dependability.

Builders machines are attractively designed—distinction and a source of pride to your workmen.

Builders machines are heavy with weight properly distributed, have interchangeable engine lathe boxes, and particularly efficient lubrication—minimum vibration and practically indefinite length of life.

Builders' Catalogue of Grinding and Polishing Machinery and Patented "Pull" Countershaft is just as complete and efficient as the line which it describes. If you haven't one on file, we want to send you one. Write today.

Builders Iron Foundry
Established 1820
Providence, R.I., U.S.A.

For Wet or Dry Grinding

The Safety Grinder

—in which the elements of safety tend to increase the accuracy and efficiency of the operator. The water supply is regulated by a convenient lever—a shift gives a few drops or a deluge.

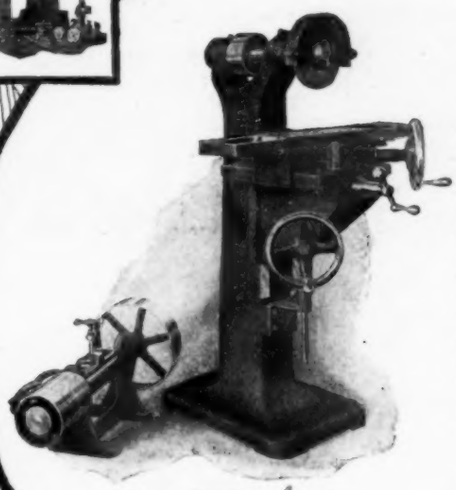
Safety Grinder for every grinding job.
Get our Catalog and choose yours.

The Safety Emery Wheel Company
Springfield, Ohio
Foreign Representatives: Farmer & Co., London

Wilmarth & Morman

Grinders

for every Requirement



No. 1 Hand Feed Surface Grinder

Your most exacting Grinding Machine needs can be met in our extensive line. We make Grinders in nearly 100 styles and sizes and every member of this large family is high class to the last detail.

Every precaution is made to exclude dirt or grit from bearings and speedy and accurate output is assured.

The catalog shows the full line. Ask for your copy.

No. 2 Automatic Dry Surface Grinder

Wilmarth & Morman Company

Master Grinder Makers

1187 Monroe Ave., N. W., Grand Rapids, Mich.

Manufacturers of Surface Grinders, Universal Cutter & Tool Grinders and New Yankee Drill Grinders

Do You Buy on Sight ——"or Insight"

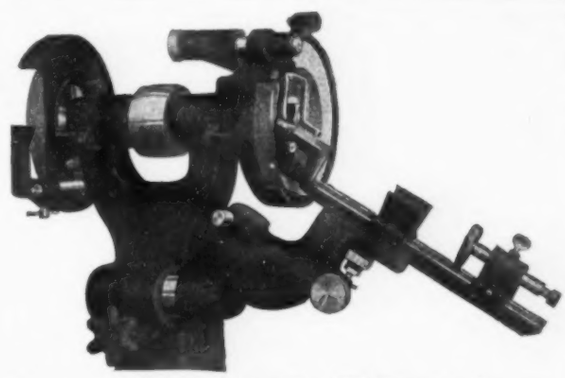
On the surface, lots of grinding wheels look O.K. for any job. So do the claims made for their performance. Fortunately, successful manufacturers don't buy on *sight.*

Vitrified Wheels

are bought mostly on *insight*—by men who study the process back of an abrasive, and its actual record for fast, even cutting and long life. By intense heat the bond of a Vitrified Wheel is made porous and cool, and actually helps the thousands of Corundum particles do the cutting.

Grinding Wheel insight proves the superiority of Vitrified Wheels. Get our literature.

Vitrified Wheel Company
Westfield, Mass.



Grand Rapids Drill Grinders

will grind your drills just as they should be to give the best results

That Means—More Holes per Dollar

NOTE—Drill holder is the very latest non-calipering type on which preliminary adjustment has been eliminated and is suitable for taper shank drills and drills with enlarged shank or socket as well as straight shank drills.

Extremely rigid swivel bearings bronze bushed and capped to exclude all grit and dirt.

Diamond-truing device working in connection with holder stop guarantees proper relationship between drill holder and face of wheel and makes it impossible for a careless workman to shove holder into wheel and grind away the lip rest.

Catalog on request

Grand Rapids Grinding Machine Co.
33 Ottawa Avenue, N. W., Grand Rapids, Michigan

This BLOUNT Grinds, Polishes and Buffs

This is the Blount Combination Grinding, Polishing and Buffing Machine. Has self-oiling, line reamed, babbitted bearings. Made in five sizes for 8 to 16-inch wheels.

Emery wheels or wood polishing wheels may be used on left-hand end of spindle; buff wheels on right hand.

Write for our catalog on Grinding and Polishing Machinery and Speed Lathes.

J. G. BLOUNT COMPANY
Woodland St., Everett, Mass., U. S. A.

Greenfield
Trade Mark
Reg. U. S. Pat. Off.

A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding.

An all-around machine for your tool-room.

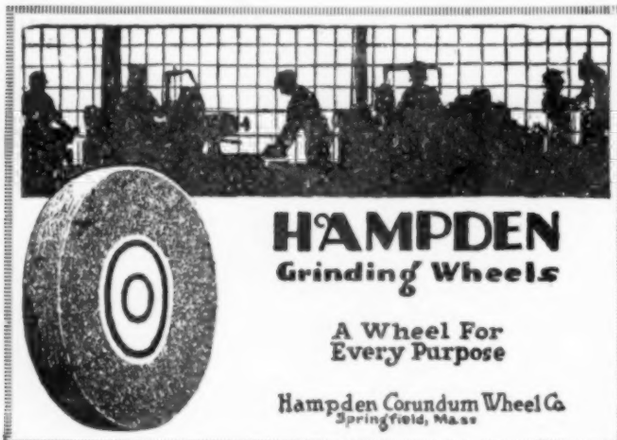
Catalog No. 6.

Greenfield Machine Co.
Greenfield, Mass., U. S. A.

Plug in Any Socket Ready in a Jiffy

HERGI GRINDERS

HERGI MFG. CO.
General Sales Office and Factory
Fifth St., Bridgeport, Conn.
FOREIGN REPRESENTATIVES: Goodehild & Partners, Ltd., London, Eng.; Atlantic Baltic Co., Ltd., Copenhagen, Denmark.



HAMPDEN Grinding Wheels

A Wheel For Every Purpose

Hampden Corundum Wheel Co.
Springfield, Mass

SAFETY—CONVENIENCE

If these interest you, you are also interested in our electric grinders and polishing machines.

In a class by themselves

FORBES & MYERS
170 Union St., Worcester, Mass.

Cincinnati Grinding Machines

Cylindrical Universal
Plain Cylindrical
Crankshaft
Manufacturing Internal
Worm
Cam

The Cincinnati Grinder Company
3233 Colerain Avenue, Cincinnati, Ohio

Have You Considered Disc Grinding That Difficult Job?

Let us tell you Why you should

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wis., U. S. A.

PERSONS-ARTER
ROTARY SURFACE GRINDER

A perfectly controlled precision machine, powerful and rigid enough to take maximum roughing cuts and then finish work to extreme limits. Indispensable to manufacturers of piston rings, thrust bearings, cutters, saws and the like. Write for catalogue.

Persons-Arter Machine Company
72 Commercial St., Worcester, Mass.

BADGER GRINDERS

The recently designed Badger Grinder, incorporating many practical ideas which are the result of years of experience, places the disc grinder on the list of necessary machine tools.

Disc Grinder information gladly furnished.

Badger Tool Co., Beloit, Wis., U. S. A.
E. B. Gardner, Pres. "Disc Grinder Service"; R. D. Gardner, Treas.

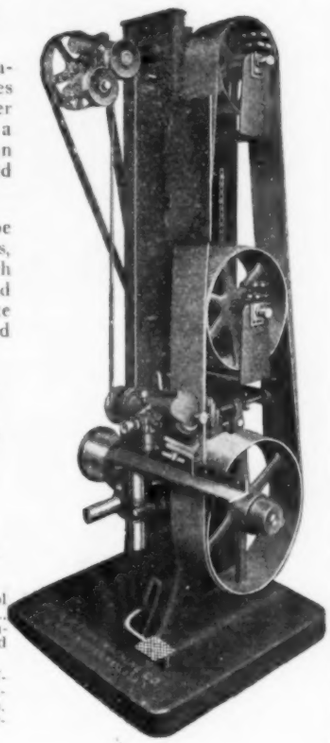
The BARNES Precision Cutter Grinder

is the fastest grinder for doing accurate sharpening of cutters without changing the relative diameters.

Our Catalog Gives the Details

William O. Barnes, Leominster, Mass.

A Production Finishing Machine That Will Give Your Product a Finish of High Quality



These Two-Belt Abrasive Finishing Machines not only turn out a better finished product—but a higher percentage than ordinarily accomplished on a finisher.

Our machines can be readily operated by boys, thus doing away with the necessity for skilled labor. They eliminate friction and chips, round edges and chatter.

Request a copy of our Catalog

PRODUCTION MACHINE COMPANY

Formerly
Blevney Machine Co.
Greenfield, Mass.

AGENTS: Cadillac Tool Co., Dodge Power Bldg., Detroit; Federal Machinery Sales Co., Chicago and Milwaukee.

OVERSEAS REPRESENTATIVE: Allied Machinery Co. of America, Paris, Turin, Zurich and Barcelona.

DIAMONDS

In Standard or Special Mountings

We import only the highest grade diamonds for cutting and truing grinding wheels, and will gladly submit sample packages for your approval, after which, if you desire, we can mount in standard or special mountings to suit your requirements.

Norton Tool

Landis Tool

Desmond-Stephan Mfg. Co., Urbana, O.

Manufacturers of Diamo Carbo, Magazine, Sherman & Huntington (in three sizes) Emery Wheel Dressers.

The Canadian Desmond-Stephan Mfg. Co., Ltd., Hamilton Ont., Distributors for Canada. Alfred Herbert, Ltd., Coventry, Agents for Great Britain.

The Ott 5 x 18 Plain Grinder
5 in. Swing 20½ in. between centers

OTT Simple Grinders

The simplest possible construction of Ott Grinders is a distinct aid to production, for ease of operation relieves the workman of time-consuming, unnecessary adjustments. There are no complications, weight is propely placed for rigidity and accuracy, and proper speeds and feeds are easily obtained for various classes of grinding operations.

Controls are compact and arranged to allow high speed production without forcing machine or operator.

In direct comparison, Ott Grinders easily meet standards of work set by larger and more expensive machines.

OTT GRINDER CO.
230 W. Tenth St., Indianapolis, Ind.

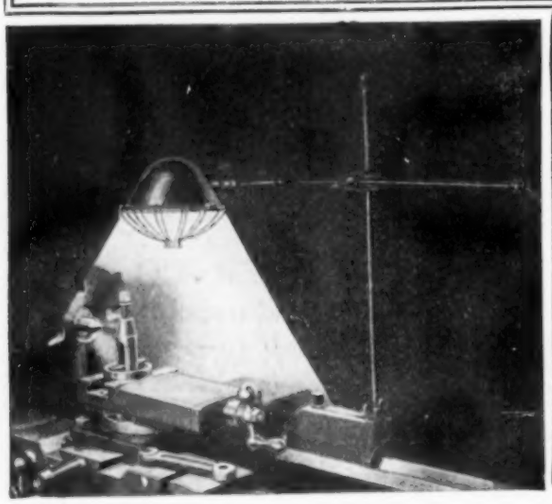
REPRESENTED BY: McMullen Machinery & Supply Co., Grand Rapids, Mich.; Ogden R. Adams, Rochester, N. Y.; Cadillac Tool Co., Detroit, Mich.; Cleveland Tool & Supply Co., Cleveland, Ohio; Coghlin-Kirby Machinery & Supply Co., Toledo, Ohio; Syracuse Supply Co., Syracuse, N. Y.; Dale-Brewster Machinery Co., Chicago, Ill.; Swind Machinery Co., Philadelphia, Pa.; L. S. Devos, Export Representative, New York, N. Y.; The Fairbanks Co., St. Louis, Mo.; F. O. Stallman Supply Co., San Francisco, Cal.; Barbour, Love & Woodward, Inc., New York, N. Y., and Selson Engineering Co., London, England.

THE ANYANGL LIGHTING FIXTURE consists of an upright support and an adjustable extension or cross-arm, instantly adjustable by means of a quick-acting thumbscrew, to any desired position in a complete arc, in either a vertical or horizontal plane. To the extension arm is attached the reflector, which is correctly shaped to concentrate the light rays and project them directly upon the restricted area where the light is needed, and instantly adjustable to the correct angle to overcome the necessity of operator being compelled to work in his own shadow, or the shadow of surrounding objects.

The illustration below gives a good idea of the method of attaching the fixture and the manner in which the light rays are projected upon the work. Under its clear and properly controlled light, every move of the worker is made sure, safe and speedy, increasing his efficiency to an appreciable extent. It also relieves the objectionable eye strain of night work and its resultant evils. Another feature, the lamp is protected against breakage and theft.

If you have night workers, or if necessary to use artificial light at any time in shop or office, you cannot afford to sacrifice the increased efficiency insured by ANYANGL LIGHTING FIXTURES. The installation is low in first cost and upkeep. Write for descriptive matter and prices.

Miller Saw-Trimmer Co.
Pittsburgh, Pennsylvania



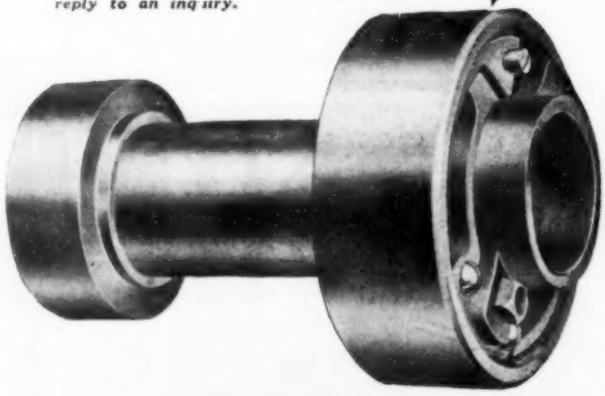
The Friction Shoes—

of a Mule Pull (Expanding Ring) Clutch, lagged with renewable asbestos brake lining held by tubular copper rivets, increase horsepower and permit high-speed operation—

And Two Anti-Friction Rolls—

which move radially in and out over hardened tool steel surfaces develop an extremely great pressure on the shoes. This type of leverage makes the clutch powerful, but easy to operate. There are other features, too.

On line shafting or incorporated in machine tools, Mule Pull Clutches completely control power and greatly reduce transmission costs. How? We'll gladly show you in reply to an inquiry.

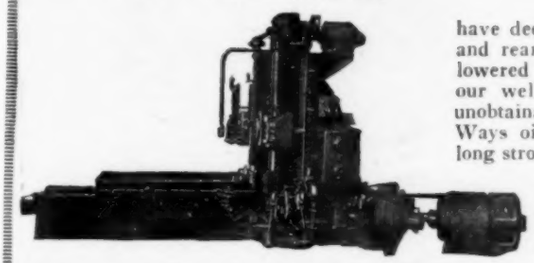


BROWN ENGINEERING CO.
115 No. Third St., Reading, Pa.

William Sellers & Co. Incorp.

Philadelphia, Pa.

Labor-Saving Machine Tools



have deep box girder crossrail extending back between uprights and bolted front and rear, giving unusual strength to resist cutting strains. Crossrail raised and lowered by power and stops automatically at top of uprights. Table driven by our well known spiral pinion on diagonal shaft giving smoothness of motion unobtainable by any other method, and permitting bracing of bed between uprights. Ways oiled by power pump insuring thorough lubrication on short as well as long stroke.

Tool Grinders **Shafting** **Drill Grinders**

CORTLAND GRINDING WHEELS

Oxaluma Wheels *for all Steel Grinding*

Carbora Wheels *for all Iron Grinding*

Cortland Grinding Wheel Co., Cortland, N.Y.

The H.P. Ball Bearing Wheel Dresser
Replaces Diamonds
Cuts Costs 50%
It's Guaranteed — Investigate
The H.P. Company Midland, Mich.

FRANCIS & COMPANY
Best quality, securely set, well mounted and finished
Diamond Grinding Wheel Truing Tools
Assortment sent for selection on request.
Established 1799
First Nat'l Bank Bldg., 50 State St.
HARTFORD, CONN.

WHITNEY CYLINDER GRINDERS

For grinding all kinds of gasoline engine cylinders as well as castings too large or too heavy to revolve.

Machines furnished to grind holes from 3-in. up to 7-in. diameter and 14-in. deep can be equipped to grind holes as large as 14-in. diameter and 20-in. deep. Write for new catalogue.

BAXTER D. WHITNEY & SON, INC.
Winchendon, Mass., U. S. A.

"Knoeppel Organized Service"

Our service is constructive betterment applied to industrial plants, aimed to increase production, reduce costs and improve industrial relations.

Our position in our field warrants your consideration.

C. E. KNOEPPEL & CO., Inc.
52 Vanderbilt Ave. *Industrial Engineers* New York

The STAMCO
Heavy Duty Back Geared Crank Shapers
STREINE TOOL & MFG. CO.
New Bremen, Ohio, U. S. A.

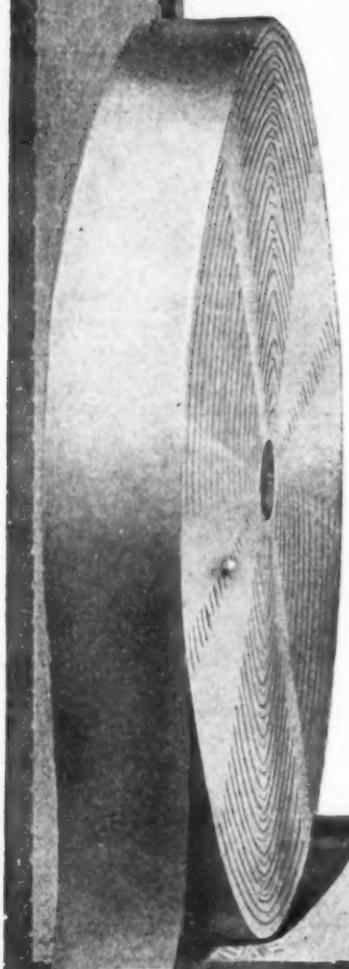
Stamets No. 44
Vertical Milling Machine
The machine of many refinements. See our advertisement in the 1st and 3rd issues of the month.
William K. Stamets
Pittsburgh, Pa., U. S. A.

Sterling Grinding Wheels
Are No Experiment
They Have Been On The Market For Over 29 Years.
The Sterling Grinding Wheel Company Tiffin, Ohio

Service Quality
INDUSTRIAL GEMS
DIAMOND TOOLS
FOR TRUEING GRINDING WHEELS
Our FERALIUM Diamond Setting is GUARANTEED
THE JOYCE-KOEBEL COMPANY, Inc.,
39 West 32nd Street, New York, N. Y.
Send for our Catalog No. 100.

Ladew

SINCE 1835



We repeat—you pay for the belt you need, whether you buy it or not. And unless you start with the right belt, you'll pay a higher price than you need have done. What you apparently save in buying a belt of low first cost, you will eventually pay in repairs, replacements, wasted power, lost output. You'll pay out as much money—but you'll get less service—and a lot of needless worry and trouble. The sale of Ladew Leather Belting increases from year to year, because belt buyers are learning from sad experience that the best belting costs least.

EDW. R. LADEW CO., INC
GLEN COVE, NEW YORK, U.S.A.

Since 1835

Branches and Distributors in All Principal Cities of the World Carry Complete Stocks. See your phone book for local address.

AP-57

THE month is rare that does not contain an out-of-the-ordinary demand for Jones Service.

Last March we received an order for an enormous pulley, fourteen feet in diameter, weighing over two tons. It had to be completed and delivered in far quicker time than most manufacturers could have possibly done it.

Yet Jones tackled the job, and completed it in record time. And from what our customer said—from his expressions of applause—we felt justified in calling it a good job, well done.

W. A. Jones Foundry & Machine Co.
4404 West Roosevelt Road, *Chicago.*
New York 20 Murray St.

Couple up your shafting with a

Bond

Patent Spiro Coupling!
50% More Gripping Power

—is obtained when shafting is coupled with the Bond Spiro Compression Coupling.

No Keyseats and Slots.

It grips with the Bond Bulldog tenacity making the shaft as one piece.

Request a copy of Catalog 38-AM. It imparts much about Bond Power Transmitting machinery

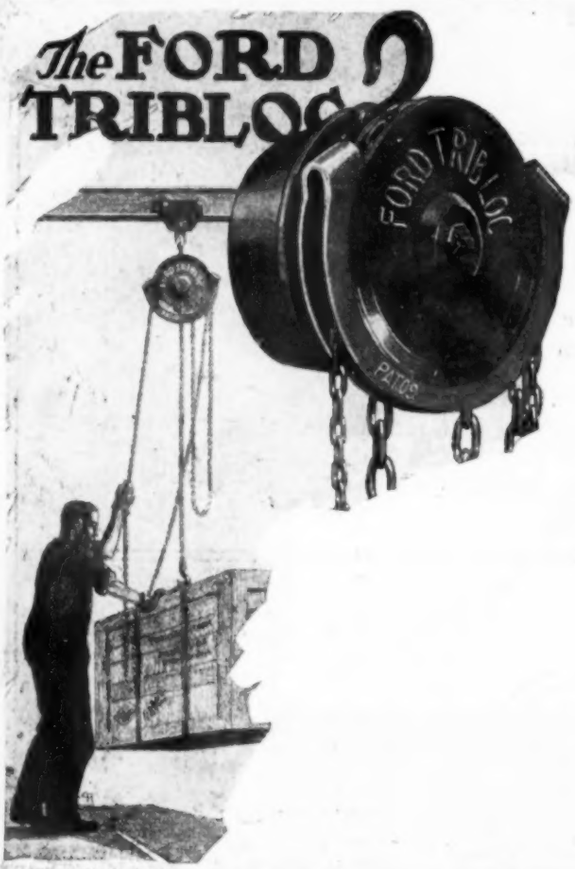
Bond Foundry & Machine Co.

Sole Manufacturers

Manheim, Lancaster Co., Pa.

ASSOCIATED COMPANIES:
Charles Bond Company, Philadelphia, Pa.; J. & G. Rich Company, Philadelphia, Pa.
Christiana Machine Company, Christiana, Pa. Bond Engineering Works, Ltd., Toronto, Canada.

The FORD TRIBLOC



THE hand chain of a Tribloc may be operated from any angle, at any speed without "gagging" or over-riding the hand-wheel flange, because of the patented Loop Hand Chain Guide.

Ford Triblocs have the most efficient form of chain hoist mechanism yet devised—a planetary system of steel spur gearing.

Rugged construction, simple and few parts, and the very best of selected steel chain and forged steel hooks combine to make the Tribloc long-lived and safe.

Our interesting Catalog No. 3 is worth writing for

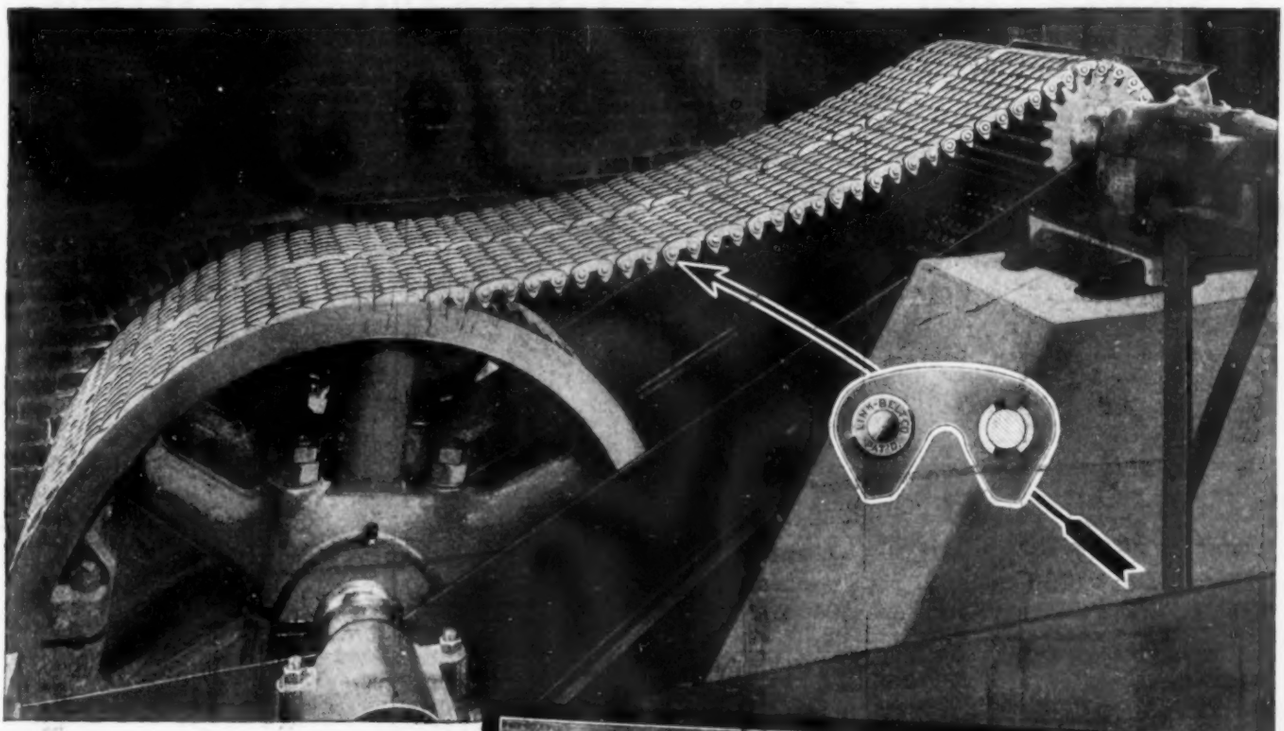
FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

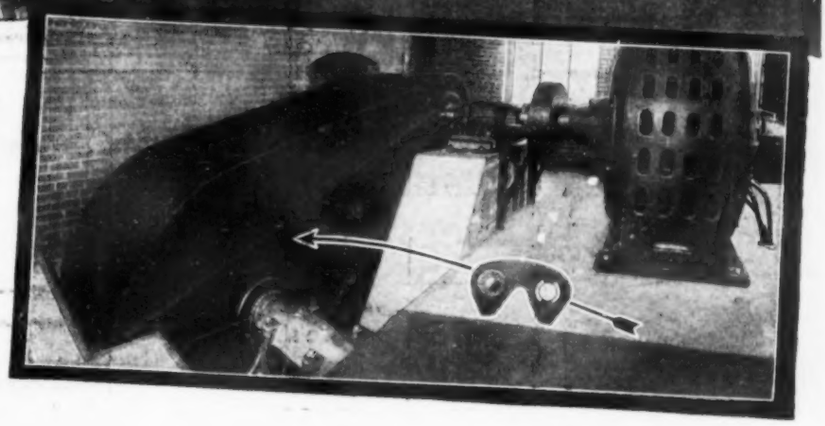
OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO DE JANEIRO

2164-D

Flexible as a Belt—Positive as a Gear—More Efficient than Either





WHERE leather and gear drives have failed, the Link-Belt Silent Chain Drive has solved many a problem. Its positive action (without slip) delivers all the power of the motor to the machines, getting the most out of them.

We can point to many successful installations in every industry where production has been increased—in some cases as high as 20%.

Its flexibility absorbs all shocks, protecting the motor, and delivering a smooth, steady flow of power to the machine.

Let one of our experienced power transmission engineers help you solve any bothersome transmission problems in your plant. Send for our Silent Chain Price-List Data-Book No. 125. It shows how to figure drives and determine prices. Sent free on request.

553A

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SILENT CHAIN DRIVES

"Camel Hair" Belting Drives Cold Saw When Other Belting Fails

This "Camel Hair" Belt runs a cold saw under an open shed and is subject more or less to weather conditions.

It transmits 120 horsepower and often has to carry sudden extra heavy loads when the saw sticks. These sudden loads make the belt slip around the pulley. The leather belting formerly used would invariably run off and be destroyed after a few months' service. The "Camel Hair" belt shown was put on in February, 1917, and is still in good running condition.

This experience proves that "Camel Hair" Belting will work indoors or outdoors under adverse conditions and still transmit more horsepower and last longer than any other belting running under the same conditions.

All dealers carry the original "Camel Hair" Belting. Look for the trade mark shown below.

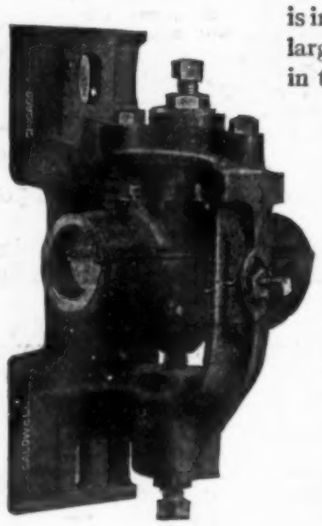
The Rossendale-Reddaway BELTING AND HOSE COMPANY, NEWARK, N.J.

Export Dept., 26 Cortlandt St., New York City

Also makers of solid woven and canvas stitched beltings

The original "Camel Hair" Belting is sold by all dealers. Look for the trademark.

CALDWELL
Power Transmitting Machinery



is in use in some of the largest machine shops in the country.

We carry a complete line of pulleys, shafts, clutches, etc.

And we are prepared to make special equipment to order.

In selecting Caldwell machinery you secure equipment built to a standard that assures its long life.

H. W. Caldwell & Son Co.

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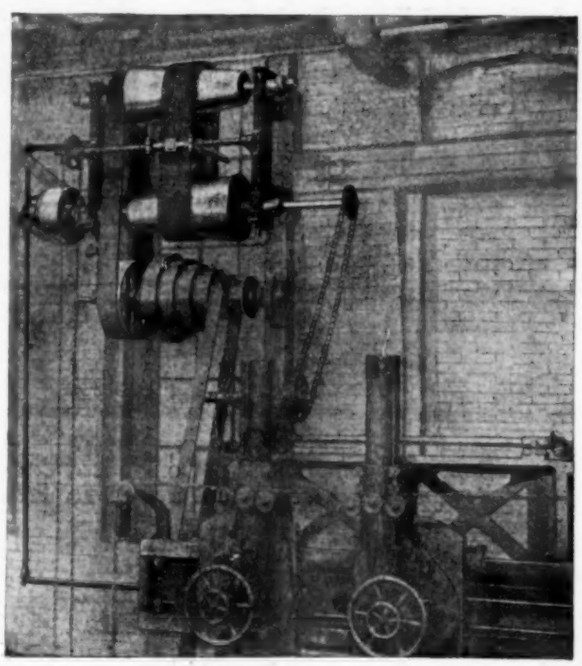

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Will permit you to run one gang of machines while the others remain idle, thus saving a large portion of the power. Send for details.

The Moore & White Co.

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Banish Your Belting Troubles

Troubles never come singly, but, like April showers, when they start breaking they break with a rush. So it is with inferior belting. Your men are keyed to the highest pitch to maintain high-standard quantity production. A belt breaks. The machine is idle for a while. Then, as if the breaking was a contagion, more belts go wrong.

Do you want to eliminate your belting troubles? Do you want to have your shop or factory work move along without unnecessary friction? Of course, you do. We have the key that will lock the closed door on all of your belting troubles. We would like to demonstrate to you.

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depends largely on fast, efficient transferring of materials and products.

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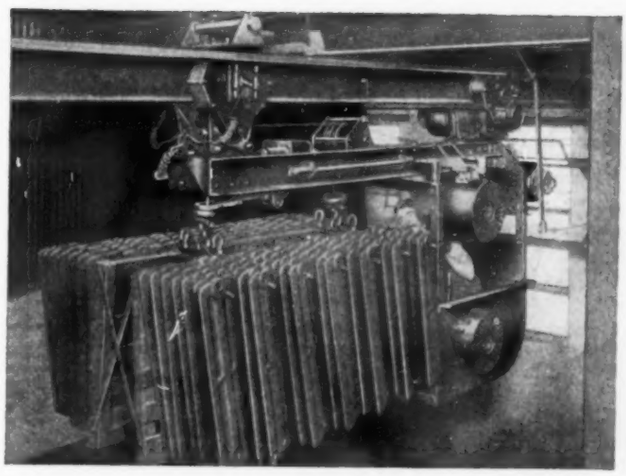
One man operating a "Shepard" can accomplish in less time more than the "labor gang."

Any plant can be equipped with a suitable Monorail system on which a Shepard Electric Hoist will convey loads to any point.

The experience of Shepard Engineers will prove helpful in the solution of most any lifting or conveying problem. Consult them without obligation on your part.



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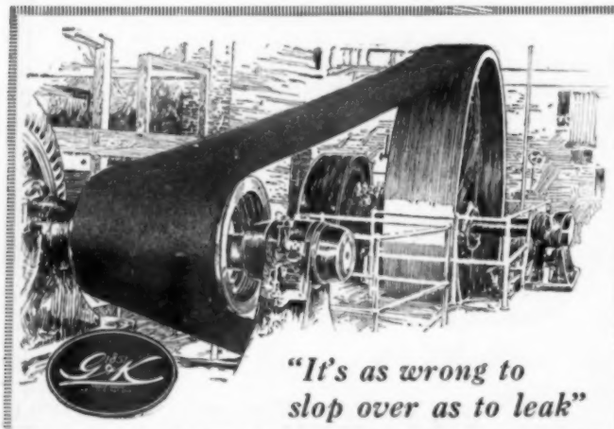

"It's as wrong to slop over as to leak"

THAT was the criticism a famous mathematician used to make of careless work in his class-room. It applies to losses in power transmission through "overbelting."

Unless your belting is working under specifications laid down by engineering practice it is probably spilling or leaking a part of its power load.

One hundred per cent. results can be obtained only through using *the one* right quality and size of belt on each specific drive. The one right belt can be selected only by working out the engineering problem surrounding each drive and harnessing the drive with the belt built to meet that particular transmission demand. Guesswork in handling your power transmission is a costly variable.

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Graton & Knight Leather Belting quality rests on a sixty-year record in supplying thousands of the best belted plants in America. Graton & Knight expert service aims to make efficient application of belting to power transmission needs.

Write for our book "Standardized Leather Belting."

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Represents a proven factor of dependability in chain equipment.

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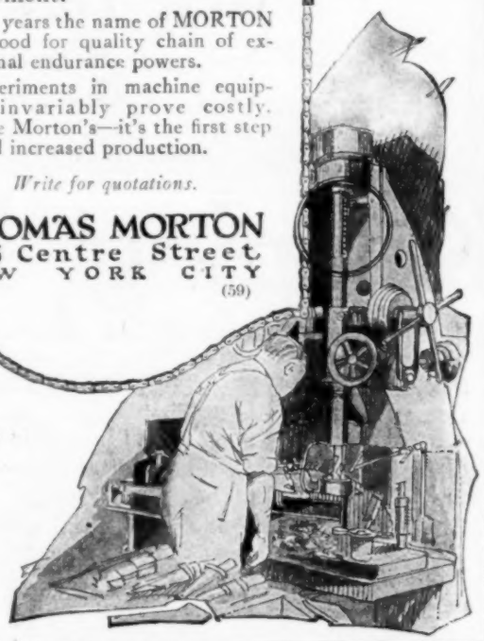

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Beginning in 1879, the Medart line has been steadily built up to include everything required in the mechanical transmission of power.

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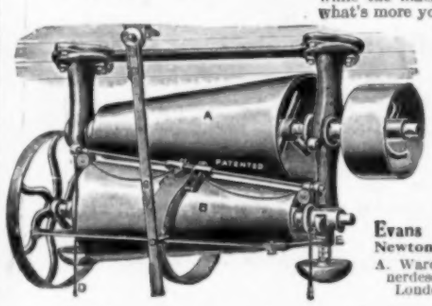

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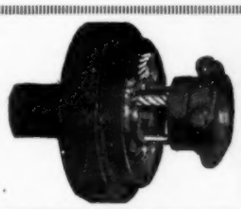

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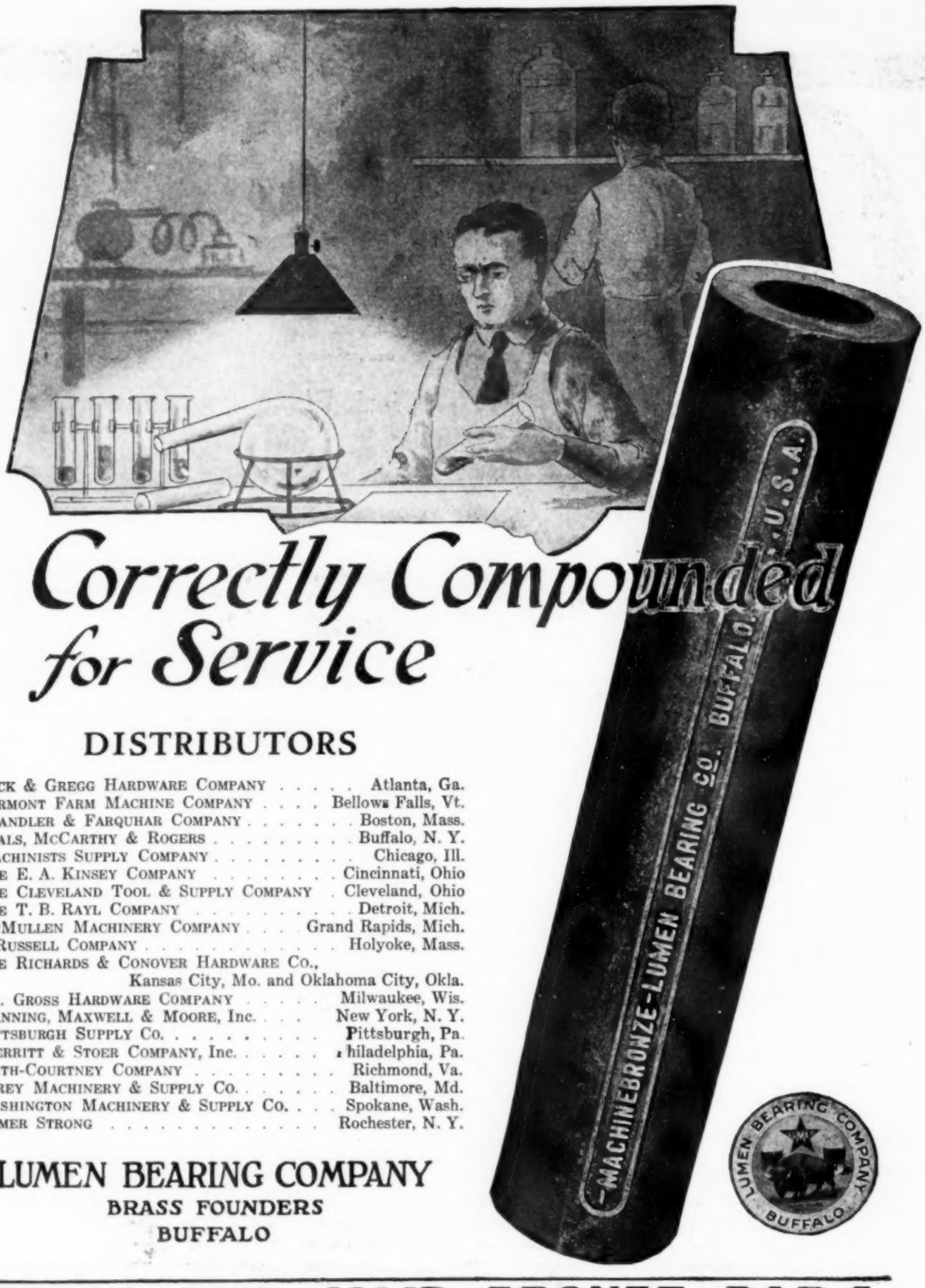

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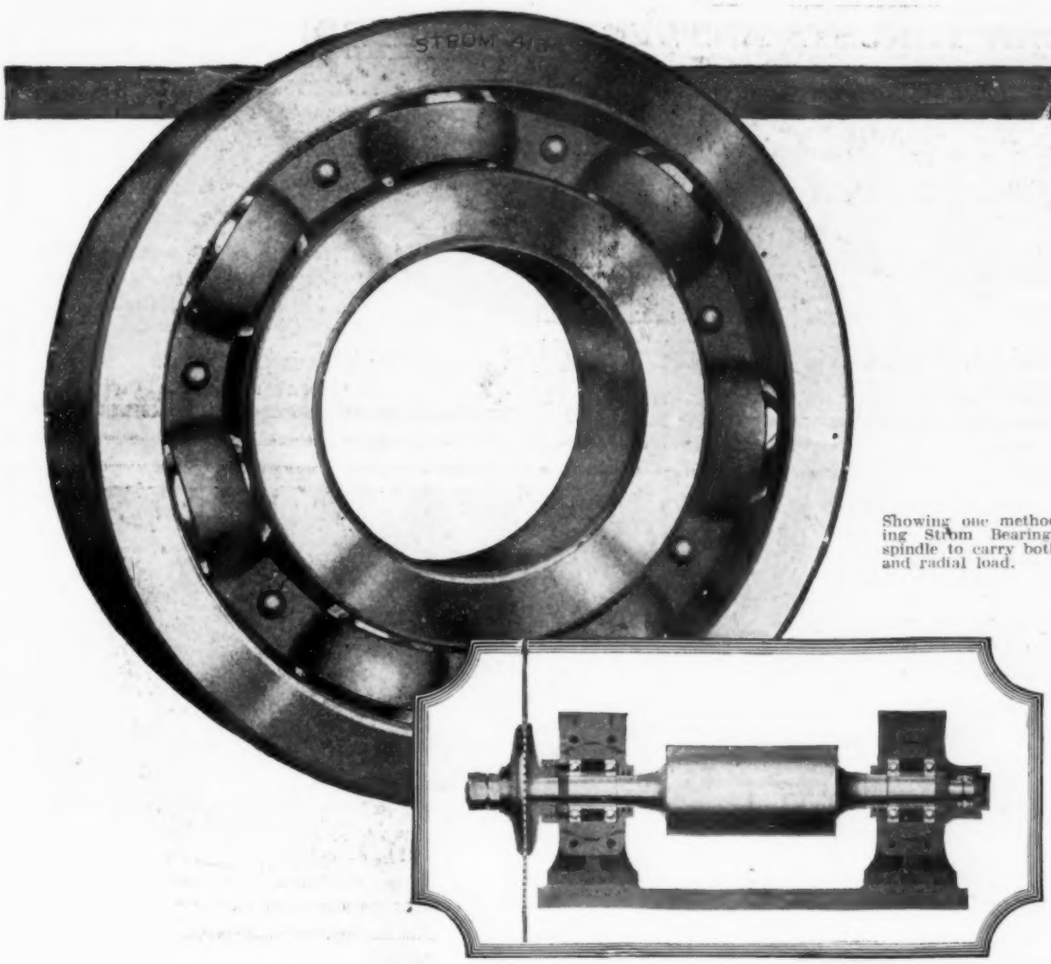

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In lathes and all other machinery using similar bearing mountings, Strom Angular Contact Bearings best carry both the thrust and radial loads.

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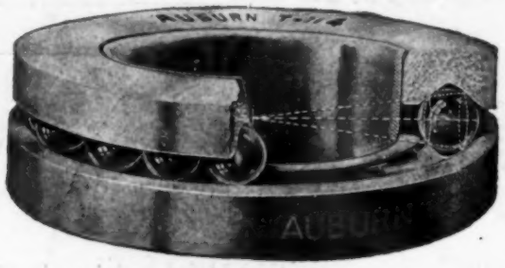

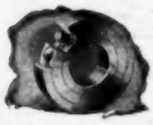

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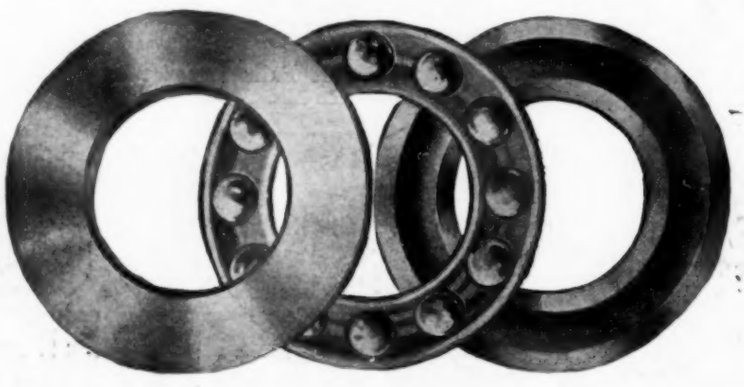
The Bearings Company of America
Lancaster, Penna.



A good bearing
It is not difficult to make a ball bearing. But a good bearing is a distinct achievement. The Schatz Universal Annular Ball Bearing embodies exclusive features of design and the highest manufacturing practice.
Specify the bearing with a margin of safety—Schatz Universal.
The Federal Bearings Co., Inc.
Poughkeepsie, N. Y.
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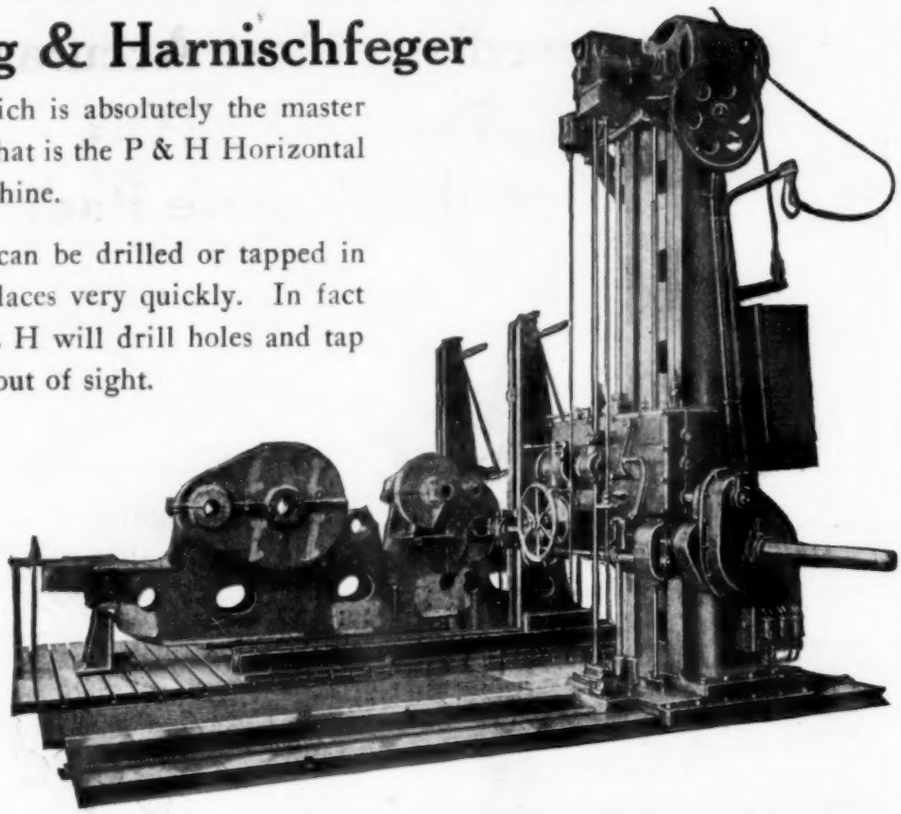
Schatz
UNIVERSAL
Annular
BALL BEARING

If You Work With Awkward Castings Get a Pawling & Harnischfeger

There is one machine which is absolutely the master of the awkward casting—that is the P & H Horizontal Boring and Drilling Machine.

With this machine holes can be drilled or tapped in the most out-of-the-way places very quickly. In fact the offset arms of the P & H will drill holes and tap holes in places which are out of sight.



Our catalog tells all about the P & H. Send for a copy.

Dale-Brewster Machinery Co.

New York:
55 Lafayette St.

Chicago:
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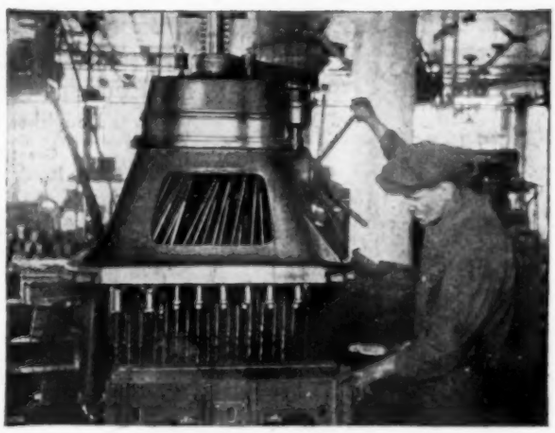
IT EATS HEAVY WORK

Harrington Multiple Spindle Drills have smashed all records in heavy duty drilling.

With ease and rapidity the Harrington does severe drilling duty of a wide nature.

Accurate, powerful, endlessly durable.

Write for Machine Tool Bulletin today



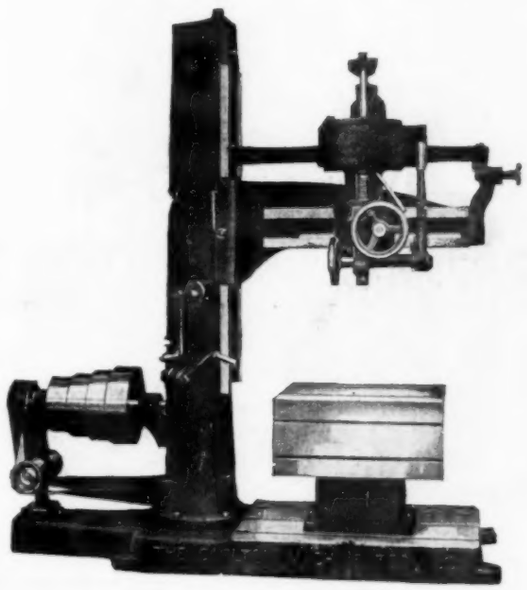
Harrington
Multiple Spindle Drills

Write for bulletin

Edwin Harrington, Son & Co., Inc.
Philadelphia, Pa.

HARRINGTON

For the Speediest, Most Accurate Drilling
The CARLTON
Speedy Sensitive Radial



In many machines when the pace is too fast accuracy is forgotten. Not so with the Carlton. The pace can be the fastest and accuracy is still on the job. Regardless of how fast you drill with a Carlton you can always be sure your work will be accurate.

Our catalog will tell you why. Send for it.

The Carlton Machine Tool Co.
Cincinnati, Ohio

Correctly Placed

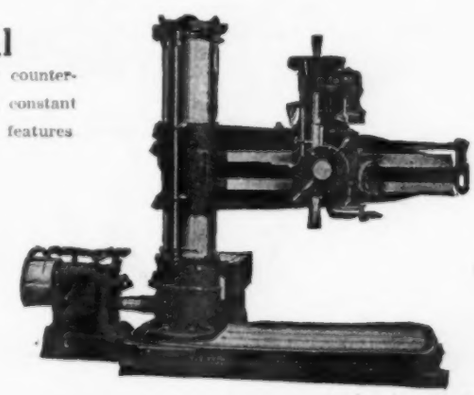
We refer to the friction for heavy drilling and tapping or for light high speed tapping or sensitive drilling or for instantly stopping and starting the spindle.

By placing the friction between the initial drive and back gears, six times more power is transmitted to the spindle without sacrificing the convenient position of the operating lever.

This machine will put a 3-inch pipe tap through cast iron 2 inches thick in less than 20 seconds.

The Self Contained Fosdick Radial

The Fosdick Heavy Duty Radial Drill does not require special foundation or countershaft. It has a metal speed and feed plate for high speed work.
Can be converted into 4 standard drives at any time. Speed box, cone pulley, constant speed motor or variable speed motor.
The base head, spindle, feed speedbox and lubrication on all have noteworthy features
Get our catalogue and learn all about them.



The Fosdick Machine Tool Company
Cincinnati, Ohio, U. S. A.

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Select Your Drill Press As You Would a Race Horse; Past Performance Counts.

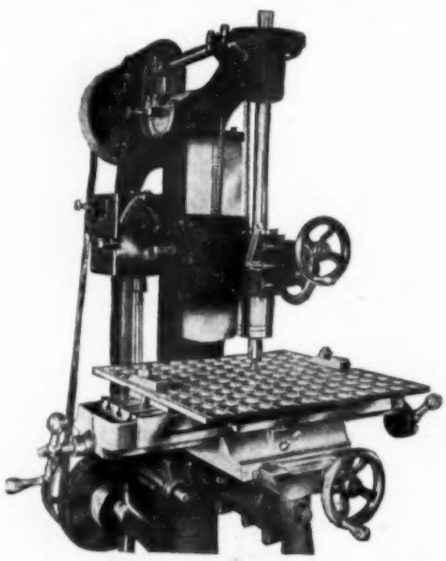
Purchasing a Radial Drill Press is similar, in some respects, to the selection of a race horse—it's the past *performance* that counts.

"Wisconsin" High Speed Sensitive Radial Drill Presses have established their record as to performance—that's why today they are growing in high favor in the manufacturing world.

We have our everlengthening list of more than satisfied customers—why not be one of them?

Request a copy of our catalog—it explains every detail of this wonderful Drill Press

DAUBER-KRATSCH CO.
Oshkosh, Wisconsin, U. S. A.



Knight Milling and Drilling Machines

They are versatile, convenient, simple-to-operate. Although the Knight is well adapted for many classes of milling and drilling, its activities can be made to cover an enormous range.

Ask Us for Catalogue.

W. B. KNIGHT MACHINERY CO.
3920 W. PINE BOULEVARD, ST. LOUIS, MO.

Are you considering the installation of high-speed, bench-type drilling machines for drilling duplicate parts?

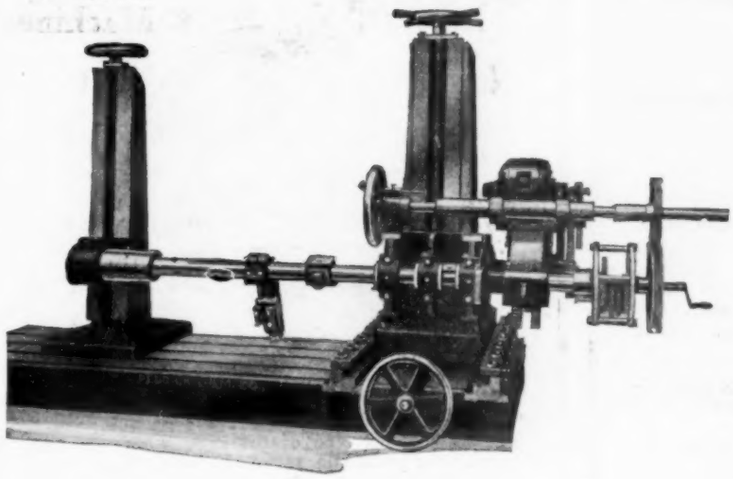
Leland-Gifford Bench Type Drilling Machines

have spindle speeds ranging from 3,000 to 10,000 r.p.m. and have proven highly productive and economical for such work.

Let us send our circular, which describes them in detail.

LELAND-GIFFORD CO.
WORCESTER, MASS.

Two methods of boring on one machine



The boring bar of a Pedrick Column Boring Machine operates either as a live spindle or as a fixed bar with cutterhead traveling along it. This is an exclusive feature of the Pedrick Column Boring Machine which gives you a choice of boring your work two ways, selecting of course, the most economical way according to the nature of the job. It also permits the handling of much larger work than machines of this size are expected to handle.

The illustration shows a No. 1 size "Pedrick," equipped with a 3½-in. bar and a runway for the column.

Undoubtedly a "Pedrick" can help you cut your production costs by handling your boring work more economically.

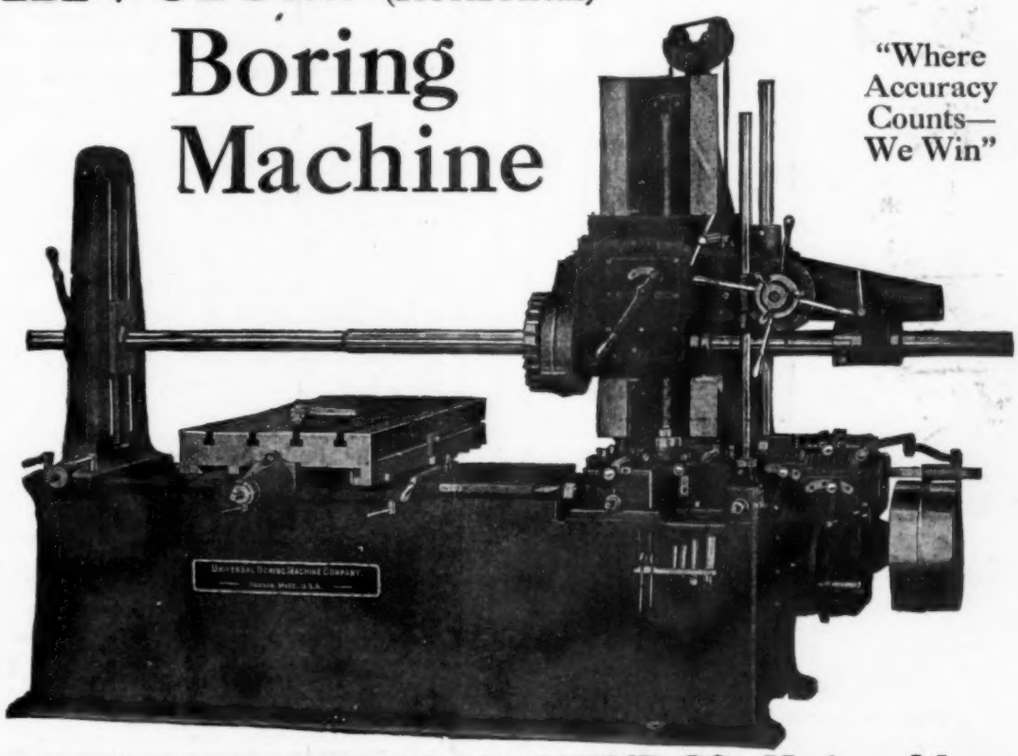
Why not let us send you full details? Write today

Pedrick Tool & Machine Company

3637 N. Lawrence Street, Philadelphia, Pa.

Universal (Horizontal) Boring Machine

"Where Accuracy Counts— We Win"



UNIVERSAL BORING MACHINE CO., Hudson, Mass.

"Tomorrow's profits are the results of today's production"

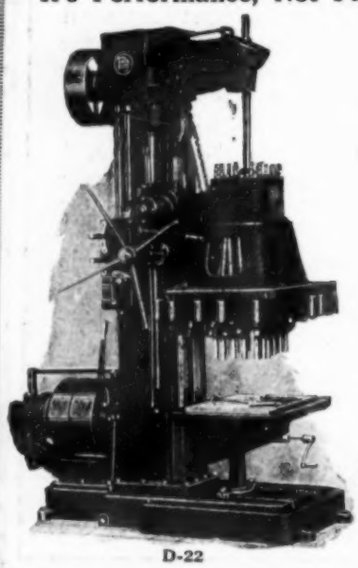
LEADERSHIP!

PRODUCTION WITH ECONOMY

FOX MULTIPLE DRILLS

SPEED WITH ACCURACY

It's Performance, Not Price, That Counts



D-22

Independent drill speed for each spindle.

Our special universal joints are made of but three parts only — two forks and one solid ball or square center block.

D-22 here shown is arranged from 8 to 24 spindles with either single or variable speed.

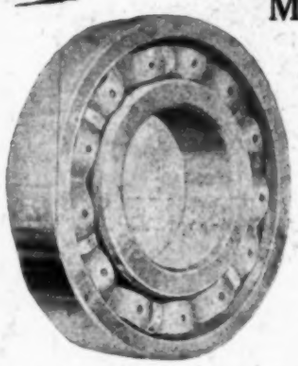
A letter today brings full particulars

FOX MACHINE CO.
1804 W. Ganson St.
Jackson, Mich.
Formerly of
Grand Rapids, Mich.

Standard Ball Bearings
are used in

Avey

Sensitive Drilling Machines



We have purposely used standard annular ball bearings of the highest grade in our machines.

The use of this type of bearings, which are used by most of the prominent automobile manufacturers, permits their replacement by local dealers in case of necessity. You don't have to wait until the manufacturer can furnish you with the special bearing of his own make.

This is just one point. We've built these machines all the way through with an eye to the greatest service to the user. *Send for complete data.*

Avey Drilling Machine Co.
Cincinnati, O.

Features

Quick Change Speed
Change in 2 seconds

Most Efficient Drive
No belt troubles

Safety First
All parts protected

Heaviest Sensitive Drill Made

All Ball Bearings

ITS TRADE A MARK SIPP

Two Seconds Is Ample Time to Change Speed on A

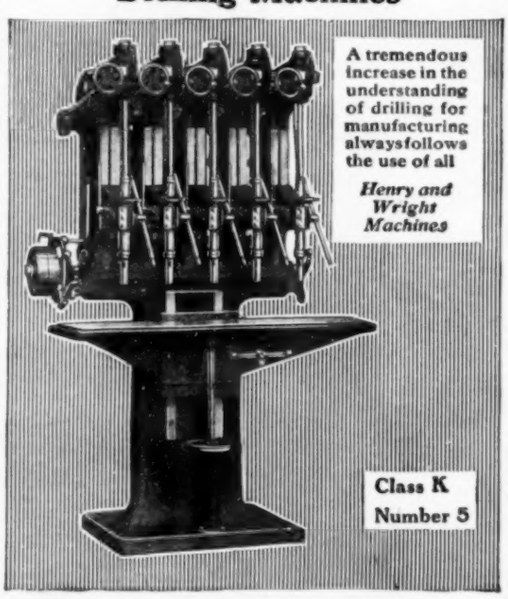
Sipp Quick-Change-Speed Drill

The reason why efficient speeds are not used on most drills is that it is so much trouble to change the operatives won't do it. You can change speed on a SIPP in two seconds by simply shifting a lever. That's one reason why *it pays* to use a SIPP.

Write for Bulletin No. 4

THE SIPP MACHINE COMPANY
Erie R.R. Ave. Paterson, N. J.

HENRY & WRIGHT
Drilling Machines



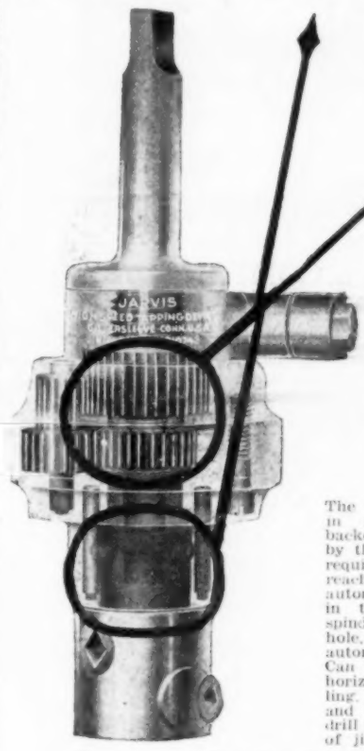
A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.
Foreign Agents: Allied Machinery Co. of America, New York, N. Y.
Paris, Turin, Zurich and Barcelona

Taps Faster—Reduces Breakage

Instant Reverse



The distinctive ball drive has proved itself a superior principle for tapping, because it never clinches or binds, and operates faster with minimum spindle power. The speed is taken direct from the spindle on the

Jarvis High-Speed Tapping Device

The gears are used simply in reversing, taps being backed out almost instantly by the Ball Reverse. When required depth has been reached, the ball drive is automatically released, and in the motion of raising spindle for tapping the next hole, the tap is reversed automatically.

Can be used vertically or horizontally. Permits drilling, reaming, counterboring and tapping on a 4-spindle drill press, with one setting of jig.

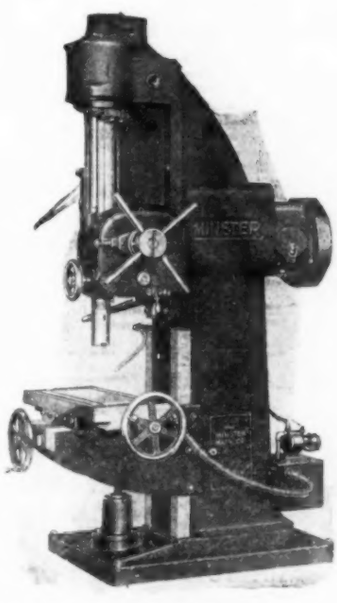
Get Our Booklet

Charles L. Jarvis Co., Gildersleeve, Conn.

For High Duty Drilling Minster Drills

Note the rigid construction of this drilling machine which enables it to withstand heavy drilling.

Designed to drive a 3¼-inch high speed Drill through solid steel at the speed and feed required by most modern shop practice. A great range of feeds and speeds are provided. There are twelve standard feeds, and any other feed is available by changing the quadrant gears.



Investigate the three sizes of Minster Hi-Duty Drilling Machines for big production in your shop.

Write for booklet

Minster Machine Co., Minster, Ohio

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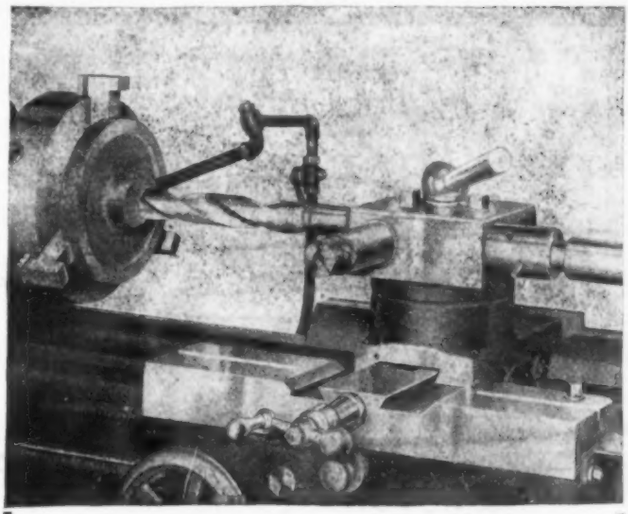


Here's the PHOENIX at Work Ready for Three Operations

Here the Phoenix is boring. Just as quickly as the operator finishes this job he will swing the reamer around and in a second's time be ready for the next operation.

Under the old method, he would have to take out one tool and set another one in, which would mean anywhere from two to five minutes wasted. Imagine this repeated twenty times every day for weeks! How much money is lost in that wasted time?

The Phoenix will turn your ordinary lathe into a turret lathe, which will save you money. Our catalog will tell you all about it. Send for a copy.

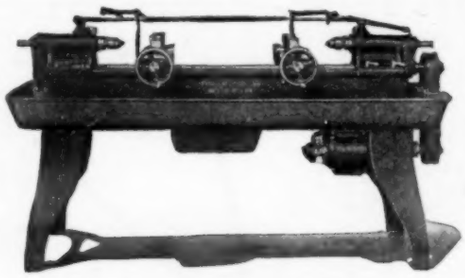
Phoenix Manufacturing Co.
Eau Claire, Wisconsin

Eastern Representative:
W. L. Harrison, 913-915 Engineers Bldg., Cleveland, O.

CADILLAC DOUBLE-END DRILLING AND CENTERING MACHINE

You can increase your output 100% with the Cadillac. Wherever drilling or centering is required at opposite ends, this double-end design can handle both jobs simultaneously. 12, 24, 36, 48 or 60 inch work can be handled between centers. For longer pieces remove the left hand head. Belt or motor driven.

Find out about the Cadillac today.



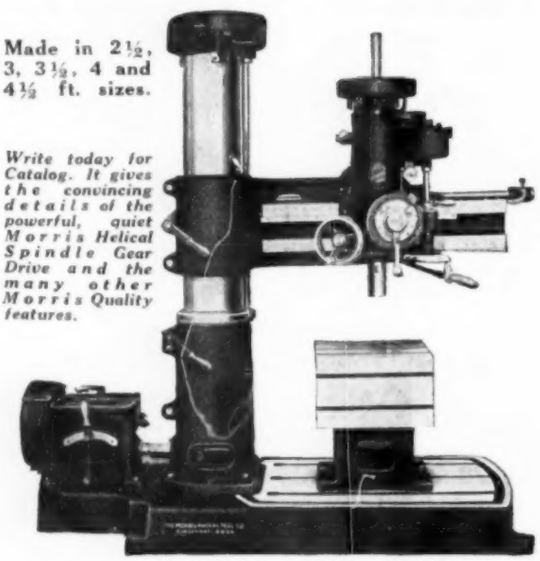
THE CADILLAC TOOL COMPANY
Detroit, Mich.

QUANTITY and QUALITY PRODUCERS

MORRIS RADIALS

Made in 2½, 3, 3½, 4 and 4½ ft. sizes.

Write today for Catalog. It gives the convincing details of the powerful, quiet Morris Helical Spindle Gear Drive and the many other Morris Quality features.



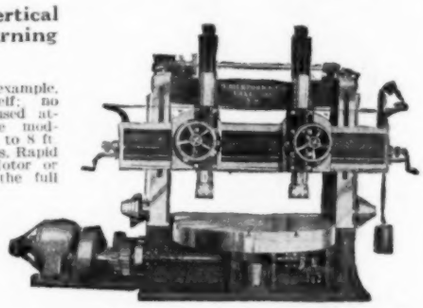
The Morris Machine Tool Company
Cincinnati, Ohio
Niles-Bement-Pond Co., 111 Broadway, N. Y.

Vertical Boring and Turning Mills

handle a wide variety of work not expedient or possible on other machines—particularly the unusual, the irregular.

BICKFORD Vertical Boring and Turning Mill

is a finely developed example. Complete within itself; no costly and seldom-used attachments, therefore moderately priced. 4 ft. to 8 ft. Single or double heads. Rapid power traverse. Motor or belt driven. Get the full catalog description.



H. Bickford & Co.
Lakeport, N. H. U.S.A.

The Barnes Is a Time Saver

Barnes ALL-GEARED DRILLS have no old, time-wasting, trouble-making belts which enables the operator to forget the machine and concentrate on the work. 8 geared speeds, 8 geared feeds.

Barnes Drill Co.
Inc. 1907
830 Chestnut Street
Rockford, Ill., U. S. A.

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TRADE MARK REGISTERED

Saving
Eyes for Workmen
Money for Management

JULIUS KING OPTICAL CO.
10-12 Maiden Lane, New York

Production is increased when you do your Multiple Drilling and Cylinder Boring

The "HOLE HOG" Way

Moline Tool Company, Moline, Ill.

HAMMOND HIGH-SPEED SENSITIVE RADIAL DRILLS

For All Rapid, Accurate Work

Write today and find out how you can cut your light drilling and tapping costs from 25 to 50%

THE HAMMOND MFG. CO., Cleveland, Ohio

Save Time, Drills Money and Material

and avoid the possibility of accidents in your drilling work. All this can be accomplished simply by equipping your drill presses with

Quickgrip Table Vises

They are the only vises of their kind on the market. Will fit any drill press and increase the capacity of your table to 16-ft. x 24-in. They grip the work firmly and instantly and the piece cannot slip beneath the drill. This means the saving of many broken drills and much spoiled work. No need of ever holding the work by hand avoids accidents. Have us tell you all about this new vise.

SPRAGUE-HAYES MFG. CO.
44 E. Larned St., Detroit, Mich.

Interested in cutting drilling costs?

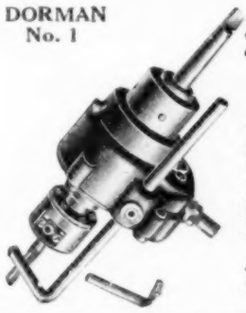
HŒFER

has made this a specialty for 25 years and *knows how*

The Hoefer engineers are at your service—without charge. Investigate. *Send for catalogs on Hoefer Drillers and Hoefer Auxiliary Heads.*

THE HOEFER MFG. CO.
Freeport, Ill.
Branches in all Principal Cities

DORMAN No. 1



Automatic Reversible Tapping Attachment

If you have some jobs on hand which require accurate, fast tapping you can handle them easily and profitably on your drilling machine equipment with the Dorman Tapping Attachment. Economical and Convenient.

JOHN H. DORMAN & SON
1-9 Bethune Street, New York City

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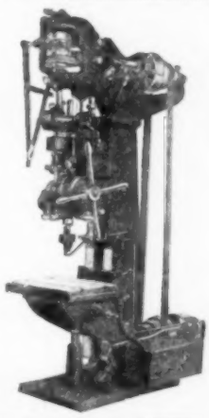
TURNER TURRET

Helps to Increase Output

The adaptability of the Turner Turret to a wide range of work makes it a good machine for every machine shop.

We also manufacture the Quint Turret

Turner Machine Company
Danbury, Conn.



Foreign Representatives: Burton, Griffiths & Co., Ltd., 64-70 Vauxhall Bridge Road, London, for Great Britain; and Allied Machinery Company of America, with offices in France, Belgium, Switzerland, Italy, Spain, Portugal.

SAVE TIME IN SCRAPING LARGE SURFACE PLATES

THAT IS WHAT THE ALLIS-CHALMERS CO. SAYS OF THE

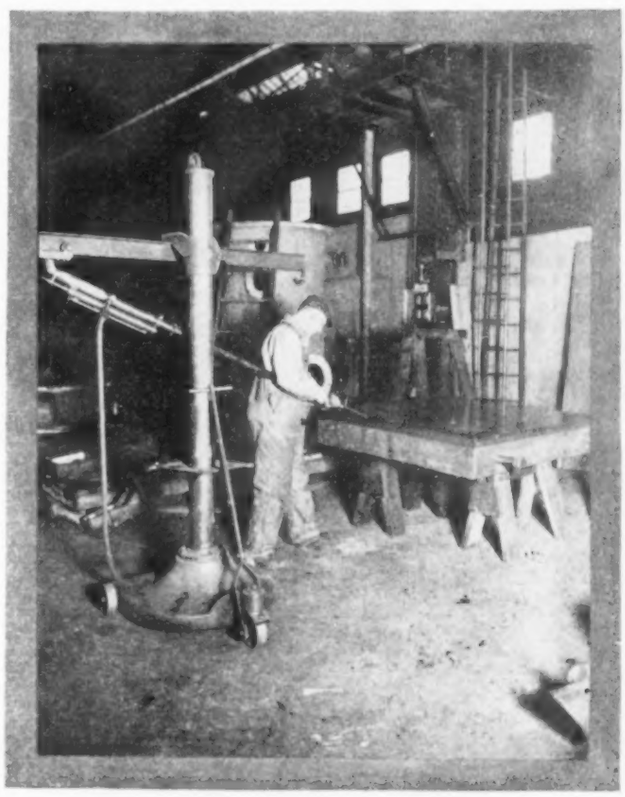
ANDERSON PNEUMATIC SCRAPERS

INSTALLED IN THEIR SHOP

Other users also say that this machine is saving them much time and money. As a matter of fact the Anderson method is much faster than scraping by hand. Owing to the ease of operation you save your operators so that they turn out better work at the end of the day.

Our literature would be of much interest to you. Write today and it will quickly start on its way.

ANDERSON BROS. MFG. CO.
120 Morgan St., Rockford, Ill.



Monarch supremacy has been gained by the building of an honest lathe that delivers service satisfactory to the purchaser.

And bearing the guarantee "Satisfaction to the Purchaser" there are more lathes produced and sold each year by the Monarch organization than there are lathes built by any other High Grade Lathe Manufacturer.

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Wm. Blake Patterson, Special Representative, Switzerland and Italy.

THE MONARCH MACHINE TOOL CO., Sidney, O.

Better Lathe Work
Can Be Done

Perfection is something you are always striving for but can never attain. A healthy discontent about the quality of your output should be encouraged rather than suppressed.

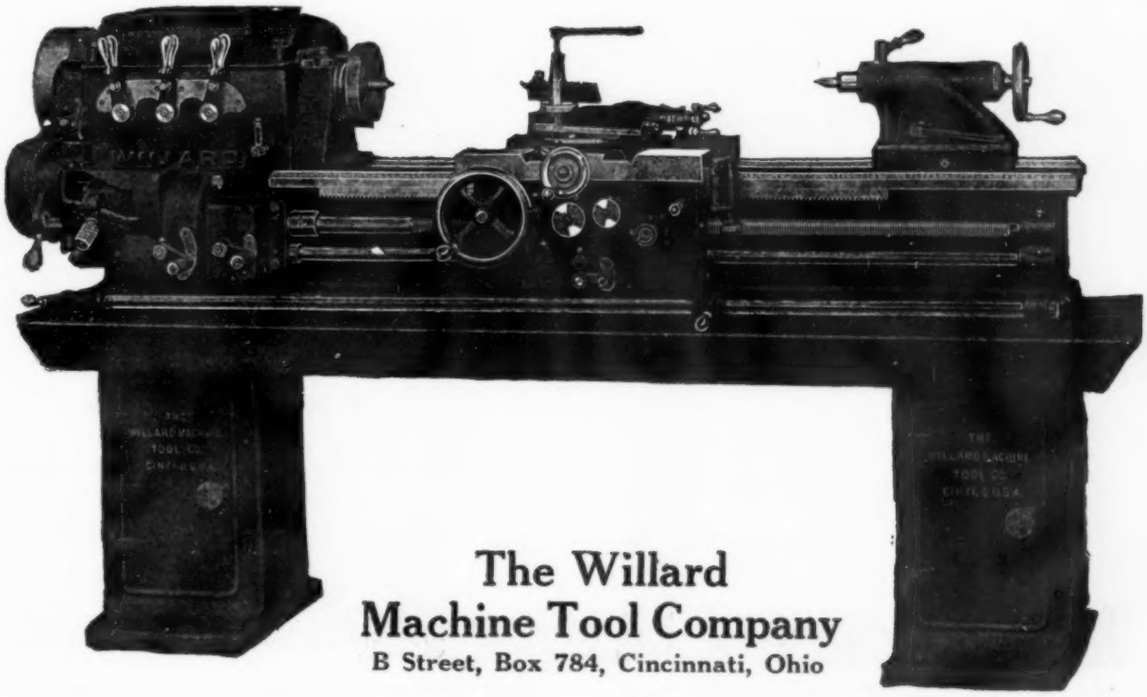
Mighty few are the shops that can't improve their lathe work. The new Willard is doing it noticeably in many plants that had before thought it impossible.

Willard All Geared Head Lathes give a finer finish, a closer accuracy, a higher percentage of accepted-by-the-inspector work. It makes your lathe output a more worthy representative of your house — a better salesman of your products.

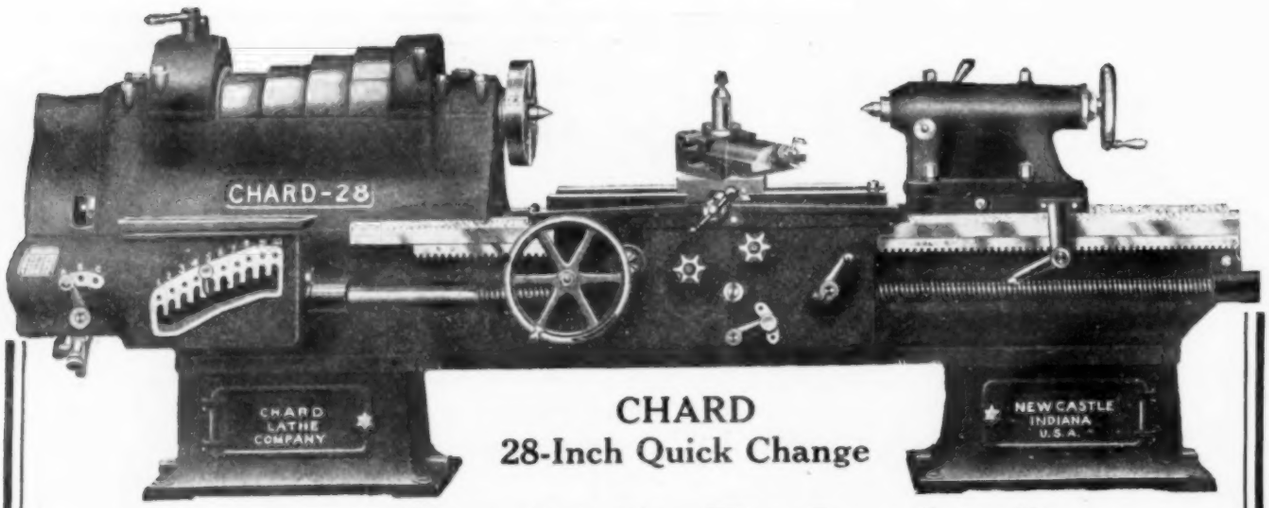
Give us an opportunity to prove this to you.

There are fundamental reasons for the high quality of work turned out on Willard Lathes

The New WILLARD
All Geared Head Lathe



The Willard Machine Tool Company
B Street, Box 784, Cincinnati, Ohio



CHARD
28-Inch Quick Change

Read This—Then Ask For The Complete Story

The bed is of massive design, well braced.

The headstock is of the four-step cone, double back gear type and of massive proportion.

Back gears are of exceptionally wide face.

Spindle bearings are of renewable type, made of special composition white metal.

Tailstock is of heavy construction and provided with setover.

The apron is of double plate construction, permitting the use of gear studs revolving in the plates, thus doing away with fixed studs on which gears are running loose.

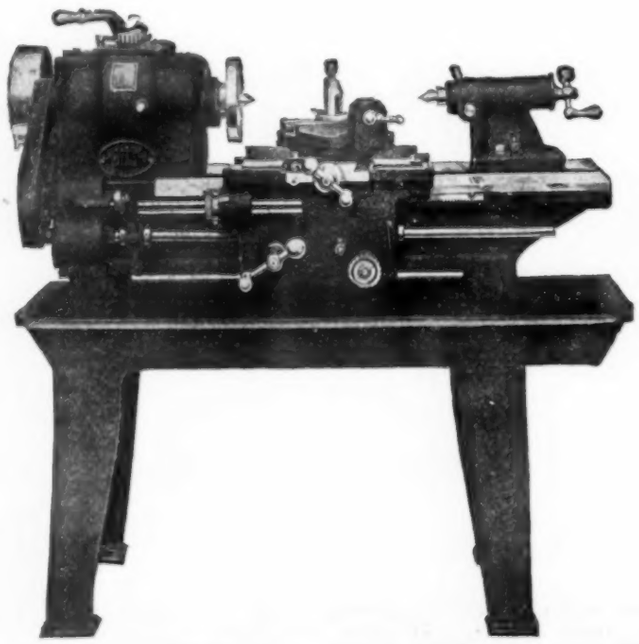
These are but a few of the desirable features of the Quality Lathe.

CHARD LATHE COMPANY, Newcastle, Indiana

The Biggs-Watterson Co., Detroit, Mich.; Dayton, O.; Cleveland, O.; Toledo, O. Thompson Machinery Co., Pittsburgh, Pa. Monarch Machinery Co., Philadelphia, Pa. F. O. Stallman Supply Co., San Francisco, Calif. Vonnegut Machinery Co., Indianapolis, Ind. McMullen Machinery Co., Grand Rapids, Mich. Manning, Maxwell & Moore, Inc., New York City; Boston, Mass.; Seattle, Wash.; Cincinnati, O.; Buffalo, N. Y.; Milwaukee, Wis.; Chicago, Ill.; St. Louis, Mo. Saxer Machinery Co., Erie, Pa. Societe Anonyme Belge, Alfred Herbert, Ltd., Brussels, Belgium.

In our own shop experience on small lots we are able to exceed engine lathe production by 50% with its use.

"Adams Short-Cut Lathe"



There's no economy in buying a lathe of such dimensions that it will handle any job in the shop.

Electrical power is expensive and if the power consumed, for the work, is not in proportion to the job then *there* is a monetary loss which in time would pay for a handy *Adams Short-Cut Lathe.*

This lathe is designed for small work yet it is capable of taking cuts possible on a 16-in. machine.

Powerful geared head with six speeds—massive crossbridge—with compound rest—and tailstock which spans the bed are but a few of the Adams features.

Write for complete details

O. R. Adams Mfg. Co., Inc.
Rochester, N. Y.

AGENTS: Fairbanks Co., Boston, New York, Newark, Baltimore, Philadelphia, Chicago; Laughlin & Barney, Pittsburgh; Ralph B. Bowman, St. Louis; Herberts Machine Supply Co., Los Angeles, Calif.; W. M. Pattison Supply Co., Cleveland, O.; National Supply Co., Toledo; Ogden R. Adams, Rochester, Buffalo, Syracuse; Gang Machy. Co., Cincinnati, Ohio. OVERSEAS REPRESENTATIVES: Allied Machinery Co., Paris.

Talk About Cutting the Cost of Output!

There is no better way of doing it on lathe work than by installing Ames Bench Lathes. Hundreds of manufacturers are using them profitably for turning, drilling, grinding, milling and thread cutting.

There are 28 of them here in the plant of the Davis-Bournonville Company drilling copper welding tips. Simplicity of design and ease of operation are evident when you consider the type of operators shown above.

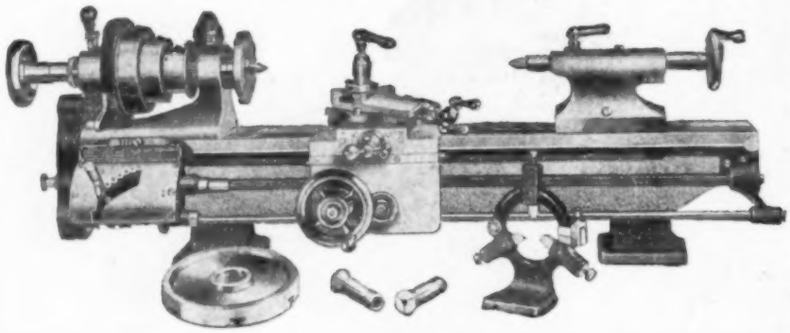
You can relieve your large lathes of an immense quantity of work by adopting Ames Bench Lathes. Doing such work on less expensive equipment is surely good business policy.

Ask for our Bench Lathe Bulletin

B. C. Ames Company
Waltham, Mass.

B.C. AMES CO.
WALTHAM MASS. U.S.A.

Wade 8-inch tool makers' lathe with 3/4-inch lead screw



The lead screw which is ¾-inch in diameter, eight threads to the inch, is made of tough crucible machinery steel, the threads being cut by a master lead screw—it has a nut of bronze metal of ample length to insure long life. The "quick change box" feature alone embodied in this lathe merits your attention.

A Catalog to you on request.

The Wade-American Tool Co.
209-311 Atlantic Ave., Boston, Mass., U. S. A.
Successors to W. H. Wade of Boston
American Watch Tool Co., of Waltham

Henry Prentiss & Co., New York, Boston, Rochester, Syracuse, Buffalo, Scranton; Sherritt & Stoer Co., Philadelphia; National Supply Co., Toledo, Ohio; Chas. A. Strelinger & Co., Detroit; Machineshop Equipment Corporation, Boston; Eccles & Smith, San Francisco. *Foreign:* Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Glasgow; Stokvis & Zonen, Inc., Rotterdam.

Send for this Lathe Circular No 104

Axelson Lathes
Heavy Duty
Quick Change, Three-Step Cone, Double Back Geared, Screw Cutting Engine Lathes
AXELSON MACHINE CO.

—Contains interesting news for Lathe Buyers

Complete specifications of Axelson 16-in., 18-in. and 24-in. Heavy Duty, quick change, three step cone, double back gear, screw cutting engine lathes are given in this circular. Gives full information. Write for your copy.

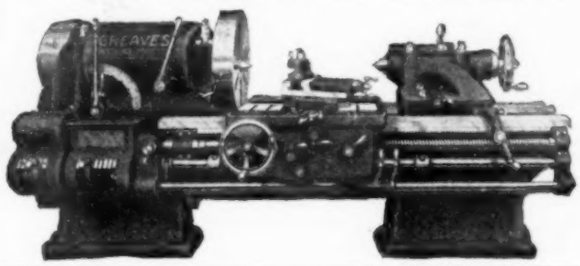
Lathe Information

AXELSON MACHINE CO
Los Angeles, California, U.S.A.

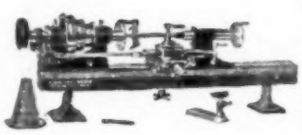
Drive It Like An Auto Truck But With Only One Lever

Investigate the possibilities of this Greaves 24-in. Geared Head Engine Lathe. The ideal Single Pulley Drive for either heavy or light duty at rapid speed.

The Greaves Machine Tool Company, Cincinnati, O.



Elgin Precision Bench Lathes

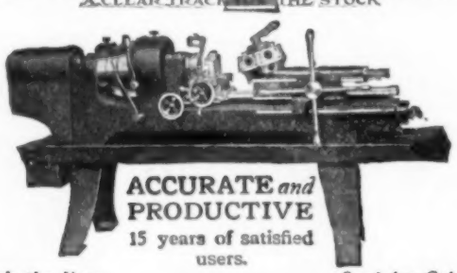


We're proud to recommend them because we know they please their users and that makes our business a pleasure. Elgin Precision Tools are known the world over for their accuracy, convenience and fine workmanship.

Literature on request

ELGIN TOOL WORKS, Elgin, Illinois

THE TILTED TURRET
A CLEAR TRACK TO THE STOCK



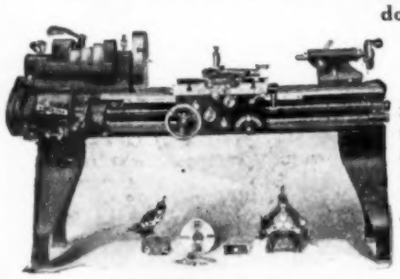
ACCURATE *and* PRODUCTIVE
15 years of satisfied users.

Ask the User *Send for Catalog*

WOOD TURRET MACHINE CO.
BRAZIL, INDIANA, U.S.A.

ECONOMY 14 Inch Swing

double backgeared Quick Change Engine Lathe



Specially designed to meet modern demands for a small heavy duty lathe to handle rapid production.

Write for complete description.

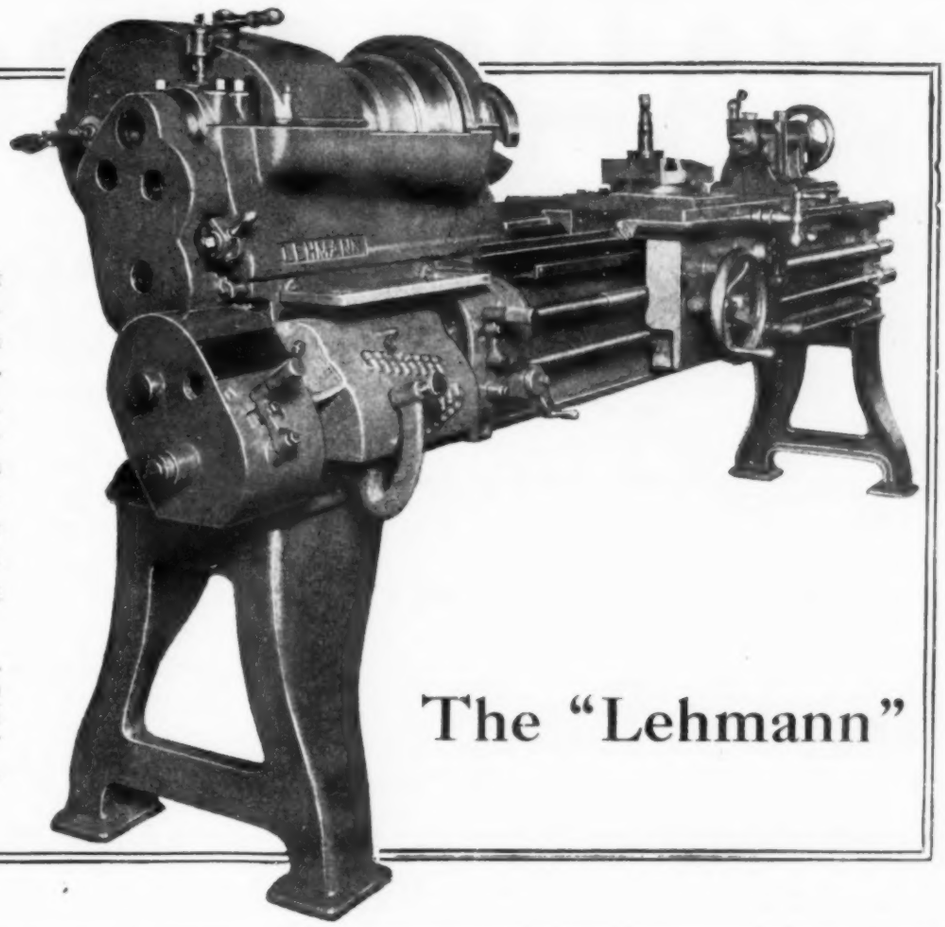
ROCKFORD LATHE & DRILL CO.
Rockford, Illinois

It Is An Exceptional Lathe!

Much may be said about the possibilities of "Lehmann Lathes." But taken from a viewpoint of actual accomplishments, you will find that production can be lifted with lower unit cost, many because of its simple, yet rigid construction, and its convenient operating methods.

"Lehmann Lathes" are durable, strong, well-built and smooth-running. Their parts are standardized and deliveries will be promptly made from our nearest agency point to you. Write to us for details.

LEHMANN MACHINE CO.
Broadway and Poplar
St. Louis, Mo.



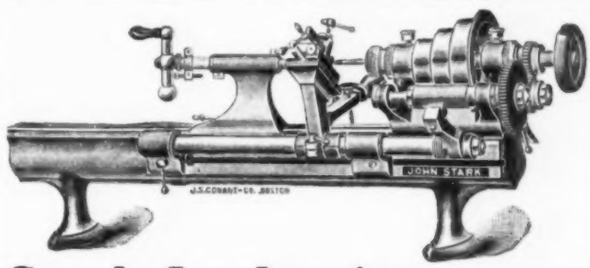
The "Lehmann"

Moderate Priced Lathes

THIS lathe has been designed principally for garage and machine shop work, built with a rod and screw feed, entirely equipped and sells at a moderate price.

Manufactured by

THE UNION LATHE WORKS
York, Pa., U. S. A.



Stark Lathe Accuracy

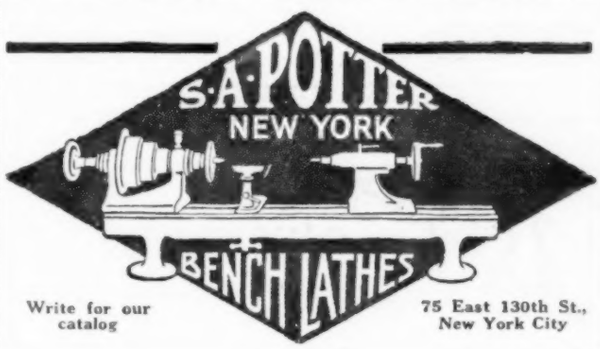
is known and appreciated wherever finest bench tools are used. We have had 58 years' experience in building these lathes and we can guarantee their efficiency absolutely.

Ask today for our Catalogue.

Established 1862

Stark Tool Company, Waltham, Mass.

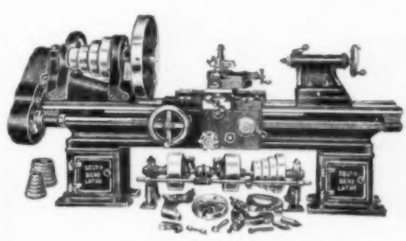
Precision Bench Lathes



Write for our catalog

75 East 130th St., New York City

SOUTH BEND LATHES



Made in six sizes, 13-in., 15-in., 16-in., 18-in., 21-in. and 24-in. swing, with beds from 4 ft. to 16 ft. in length. Straight or gap bed.

Have been on the market 14 years; over 24,000 in use.

Send for New Catalog No. 57

South Bend Lathe Works, South Bend, Ind.
422 E. Madison Street

WAHLSTROM

Drills Can't Slip in the Wahlstrom Automatic

As the strain increases, the jaws of the Wahlstrom tighten their grip, as they are designed with eccentric surfaces, rocking upon three cam faces in the shell. Shanks are never mutilated.

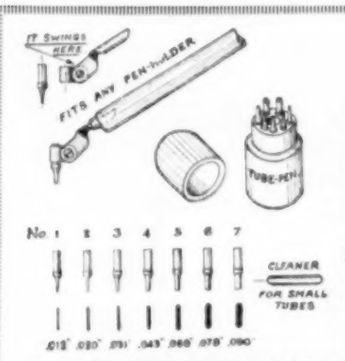
The Wahlstrom increases production by allowing instant drill changes without change of spindle. Tools are centered automatically—saving often 50 per cent of operator's time.

3 SIZES

For Straight Shank Drills up to 1 inch. Furnished also for 1, 2 and 3 Morse Taper Shank Tools.

Write for catalog and prices

WAHLSTROM TOOL CO., 5520 Second Ave., Brooklyn, N. Y.



BOURQUIN Tube Pen

Drawing Lettering
(Seven magazine pens in one)

Makes uniform lettering certain — ruling without constant refilling. Any draftsman using these pens MUST have uniform lines with uniform amount of ink. The Tube Pens see to that.

Price, $3.00
(Complete 7-pen assortment)

SPAULDING-MOSS COMPANY
42 Franklin Street, Boston, Mass.
Dealers write for proposition.

Drill Two Holes for the Cost of One

You can do it with a Nelson two-spindle adjustable drill head.

Let us send you complete information.

Nelson-Blanck Mfg. Co., Clay and Dubois St., **Detroit, Mich.**
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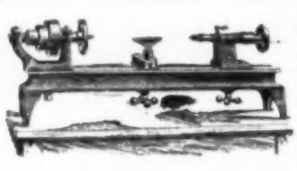
P&H cranes - hoists - monorail systems

PAWLING & HARNISCHFEGER CO.
MILWAUKEE WISCONSIN



It's Worth Looking Into

Here is a Speed Bench Lathe which will adapt itself to "a hundred and one" uses in your shop. It takes a full swing of 8 inches and is 20 inches between centers. There are many good features in the Oliver we want you to know. **Write for them now.**

The W. W. Oliver Mfg. Co.
1480 Niagara St., Buffalo, N. Y.

Libby Turret Lathe

A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. Let us give you full details.

International Machine Tool Co. **Indianapolis, Ind.**

CINCINNATI LATHES

have thoroughly demonstrated in shops everywhere what we claim. You take no chances now or years hence when you buy them. Our **Quick Change Feed Box** gives an unlimited range to cut odd or metric threads if desired, besides the standard changes made at once. *Let us figure on your requirements*

THE CINCINNATI LATHE & TOOL CO.
OAKLEY, CINCINNATI, OHIO, U.S.A.

VULCANIZED FIBRE

BE SURE AND SPECIFY

"WILMINGTON FIBRE" SHEETS ROLLS TUBES WASHERS &c SPECIALTIES

WILMINGTON FIBRE SPECIALTY CO., Wilmington, Del.
BRANCH OFFICES "EVERYWHERE"

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Make your spare time pay in cash

Twenty-five hundred shop representatives are breaking all previous records in the sales of the new American Machinists' Handbook.

But we need twenty-five hundred more representatives in the big shops and small throughout the country.

I want to send you full particulars of our liberal commission plan. I believe that I can make it worth your while to represent us.

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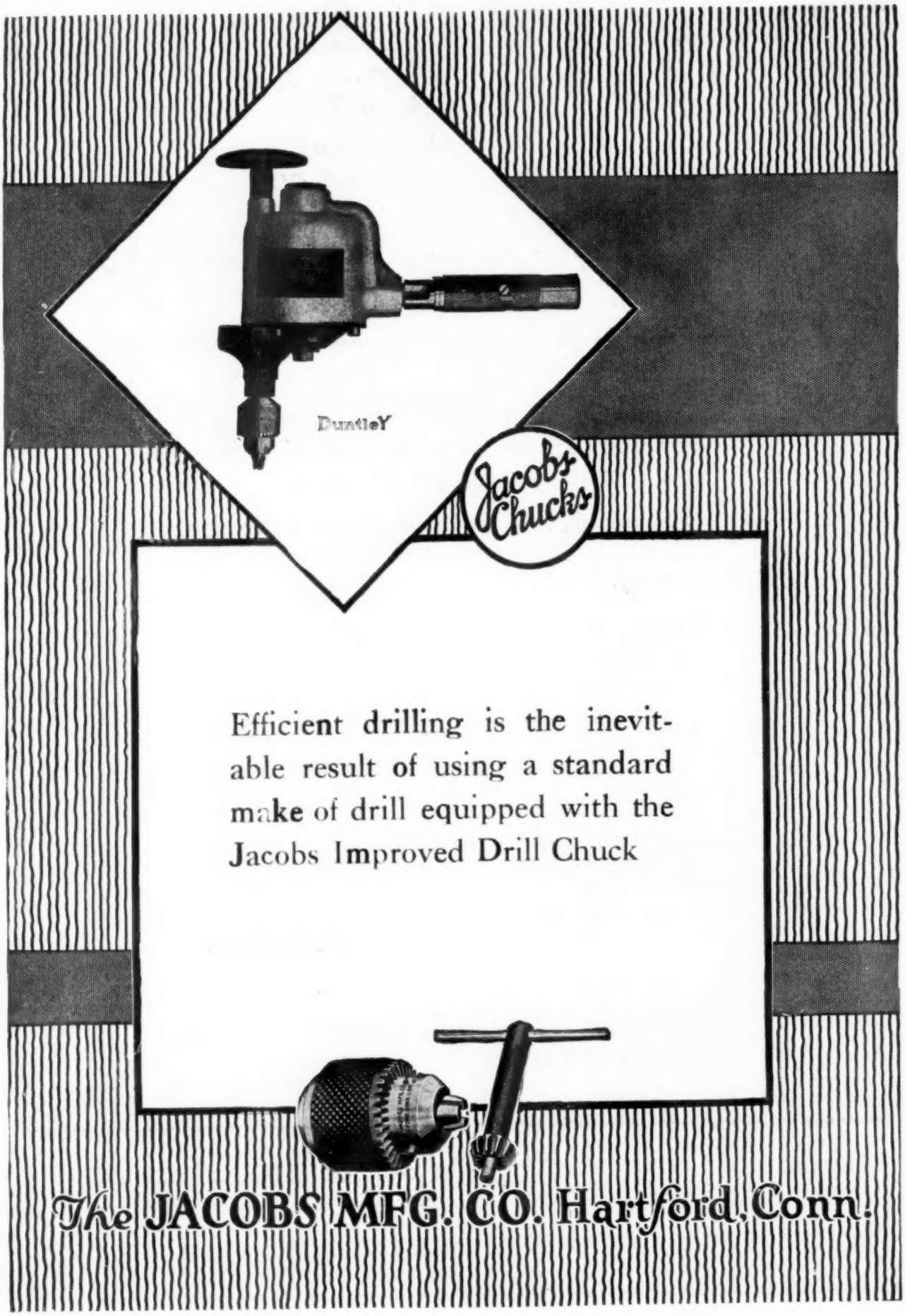

DuntleY
Jacobs Chucks
Efficient drilling is the inevitable result of using a standard make of drill equipped with the Jacobs Improved Drill Chuck
The JACOBS MFG. CO. Hartford, Conn.

BARKER WRENCHLESS CHUCK

300 Steel Tube Ends Daily— With the Aid of the Barker

A PRODUCTION RECORD like this would probably have not been so easily obtained by the Locomotive Superheater Co., of Chicago, if it had not been for the Barker Wrenchless Chuck.

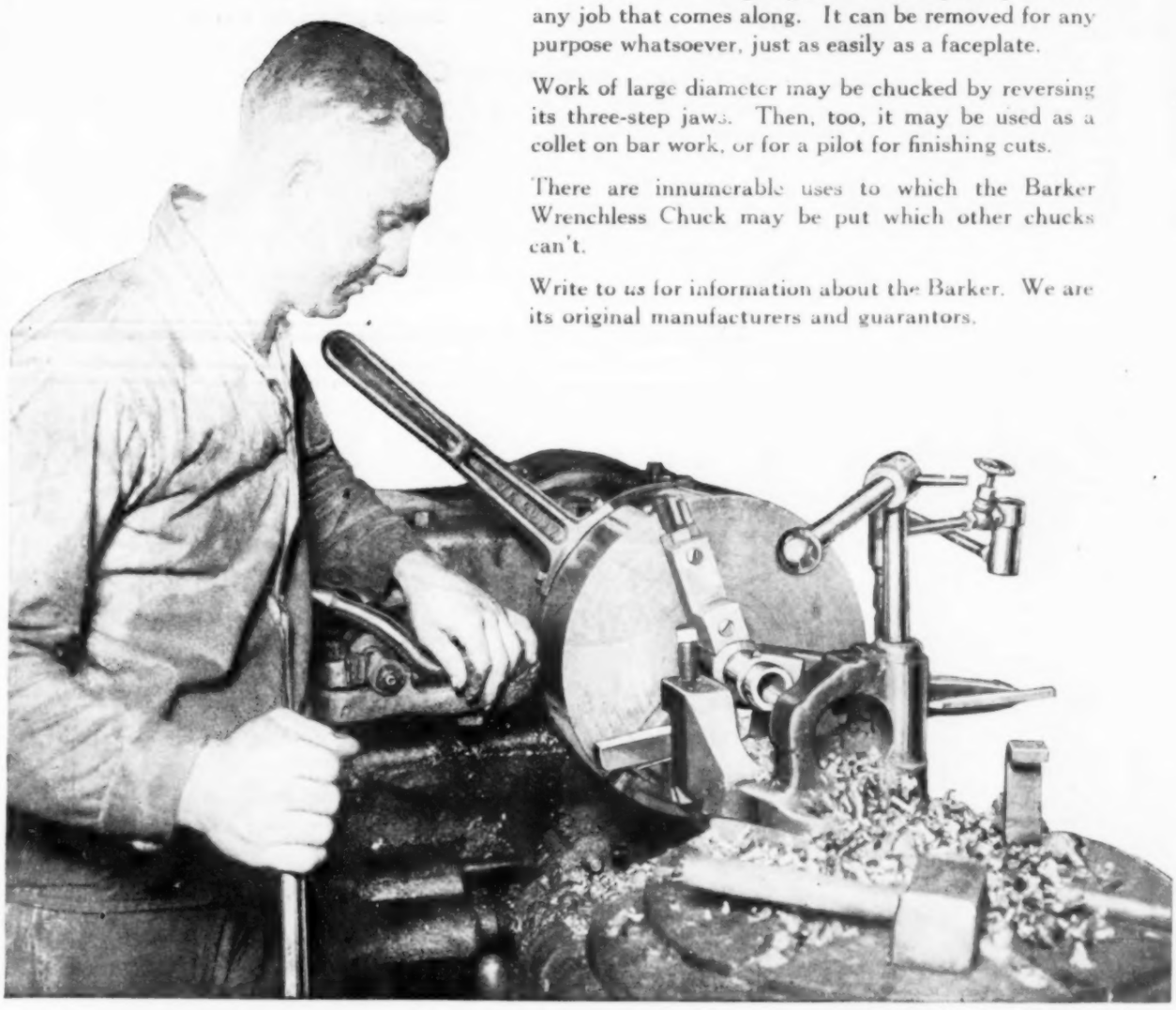
Practically no time is lost between cuts; the Barker is self-centering, and operates *instantly* with a pull of the lever.

The Barker is strong, rigid, and readily adaptable to any job that comes along. It can be removed for any purpose whatsoever, just as easily as a faceplate.

Work of large diameter may be chucked by reversing its three-step jaws. Then, too, it may be used as a collet on bar work, or for a pilot for finishing cuts.

There are innumerable uses to which the Barker Wrenchless Chuck may be put which other chucks can't.

Write to *us* for information about the Barker. We are its original manufacturers and guarantors.



THOMAS ELEVATOR COMPANY

27 South Hoyne Avenue
CHICAGO

New York Office:
Park Row Building

The DAYTON

Quick Change Chuck

This is the chuck with the quick reversible jaws. It holds both large and small diameter work with the same set of jaws.

The 4-Jaw Independent, made in sizes from 8 inches to 36 inches in diameter.

Stocked by all supply houses in the principal cities

A List of Dealers Who Carry Dayton Chucks in Stock

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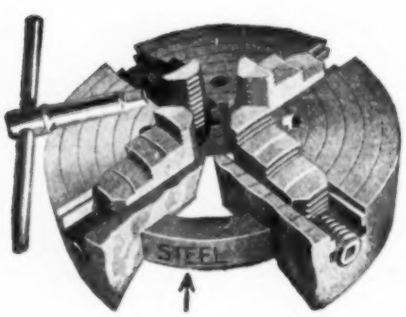
THE QUICK CHANGE CHUCK MFG. CO., Dayton, Ohio

***Successors to* The Dayton Reliance Tool & Mfg. Co.**

Department 33

PRATT ONEIDA

THE PRATT CHUCK CO. FRANKFORT N.Y.



Chucks That Make You Money—

How? By giving satisfaction due to long service even under greatest strains.

The Pratt Oneida Steel Reinforced Lathe Chuck has a solid steel ring cast in the body, reinforcing it, binding it together and making it almost unbreakable even under the most severe usage.

The Strongest Iron Body Chuck on the Market

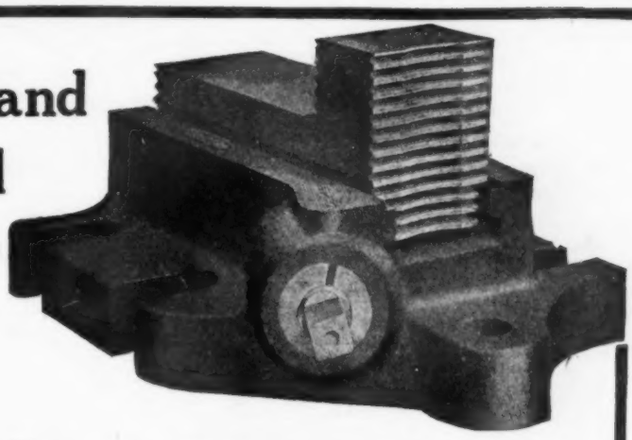
Send for catalogue

The Pratt Chuck Company, Frankfort, N. Y.

New York Sales Office and Stock Room, 1123 Broadway, New York City.
Chicago Sales Office and Stock Rooms, 557 West Monroe St., Chicago, Ill.
European Representatives: England, France, Italy and Australia, The Selson Engineering Co., 83 Queen Victoria St., London, England. Russia, The M. Mett Engineering Co., Ltd., Petrograd, Russia.

FOR HIGH SPEED INDUSTRY

They Meet the Demand of High Speed Steel



High-speed steel cutting tools operating in a powerful boring or turning mill require adequate means of holding the work to the table. Beyond a certain size it is not practical to incorporate the chucking members in the table. In all such instances you need

Independent Face Plate Jaws

(Patented)

Drop Forged Steel Body

These jaws may be applied to any make of machine.

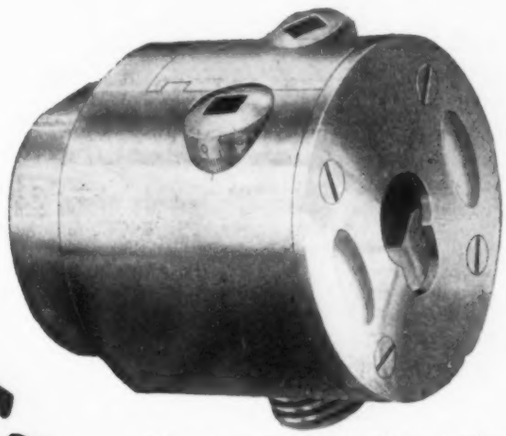
The bodies are drop-forged, heat-treated steel. Jaws are made of special chuck jaw steel so hardened as to prevent fracture or distortion under strain. Actuating screws, placed at an angle with the jaw, give a powerful differential movement which resists backward strain and tendency to loosen. Be sure and specify XAP-2 when ordering Bullard Face Plate Jaws.

Immediate Deliveries!

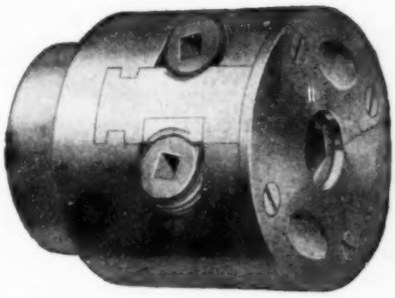
BULLARD

The Bullard Machine Tool Co.
Bridgeport, Conn.

Are You Familiar?



The new style F Casler Offset Boring Head for drilling, reaming, counter-boring accurately to size in jig, fixture and gauge work.



The Casler Twin Screw Drill Chuck provides a grip that prevents drill slipping in jaws, thereby saving drills and the time it takes to turn down shank.

MARVIN & CASLER CO., Canastota, N. Y.

THE "SWEETLAND" PRACTICAL PRIMER

Speed in setting up a job takes wasted pennies out of machining costs. When the orders read "rush" the turners demand

SWEETLAND CHUCKS

Style No. 68
Reversible Jaw
Combination

QUICK and minute adjustments are strong features in every *Sweetland Chuck*. They permit of chucking rough cast or forged pieces in a minimum of time.

The bothersome necessity of adjusting washers and nuts *behind* the chuck has been entirely done away with.

Further convenience in the rough centering of the work is assured by the accurate circles cut in the chuck face.

Sweetland Chucks comply with the law. They were among the first chucks to be made with all their screws and pinions flush with the bodies.

You will recognize their many points of superiority by reading the Sweetland Booklet. Send for your copy.

Hoggson & Pettis Mfg. Co.
New Haven, Conn., U. S. A.

"If We Put That Job on a Planer—We Need a

SKINNER PLANER CHUCK

It will hold the work down so it won't raise—The jaws are so arranged that we can easily change from the straight to the taper holds—That Skinner Planer Chuck is heavy and powerful—It's the chuck for holding down tough jobs like this one." There's much more to be said about these chucks—their design, construction, finish, the material in them, etc., etc.

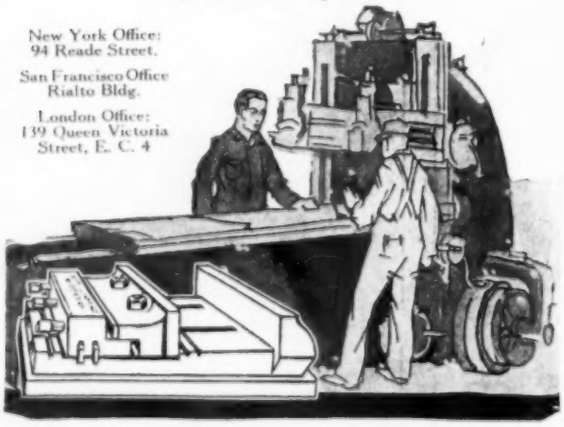
Shall we send you complete particulars?

The Skinner Chuck Co.
New Britain, Conn.

New York Office:
94 Reade Street.

San Francisco Office
Rialto Bldg.

London Office:
139 Queen Victoria
Street, E. C. 4



The ETTCO

Hand Operated, Self-Tightening

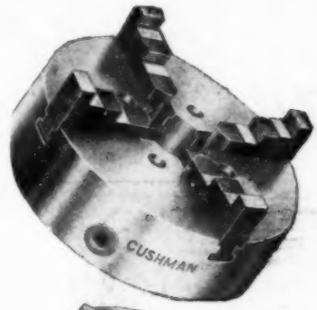
Drill Chuck

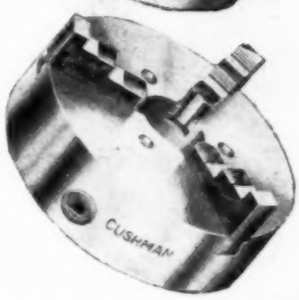
takes a positive grip on your drills without the use of keys. The motion of the chuck tightens the hold on the drill.

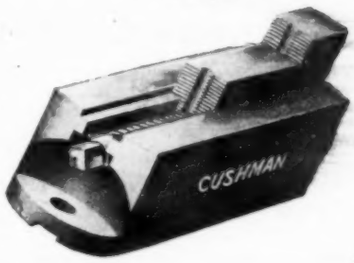
30-Day Free Trial

We will send you an ETTCO to try in your shop at your request. Write.

EASTERN TUBE & TOOL CO.
Brooklyn, N. Y.







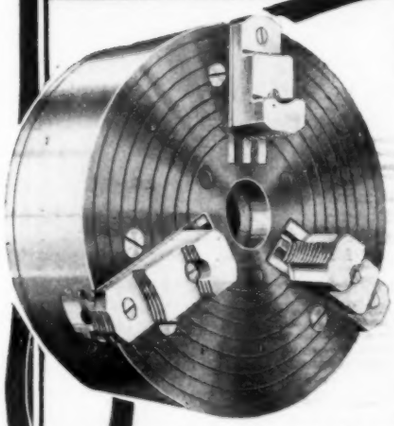
A Cushman Chuck
For Every Need in the Shop

The Cushman Line of Quality Chucks is complete. In it you will find a chuck for every chucking need.

Cushmans have made good for our grandfathers. They have been making good since 1862. The acid test of time has proved their metal.

Perhaps you would like our pocket size catalog which in brief pictures and describes our line

Cushman Chuck Company
Hartford, Conn.



M.E.C. Air Operated Chucks

The M. E. C. Air Operated Chuck is of solid semi-steel construction.

It is built to withstand the strains and stresses of hard, unusual conditions.

It is dustproof, leakproof, and foolproof.

There are no parts upon it which are unnecessary; it is simple, compact and strong.

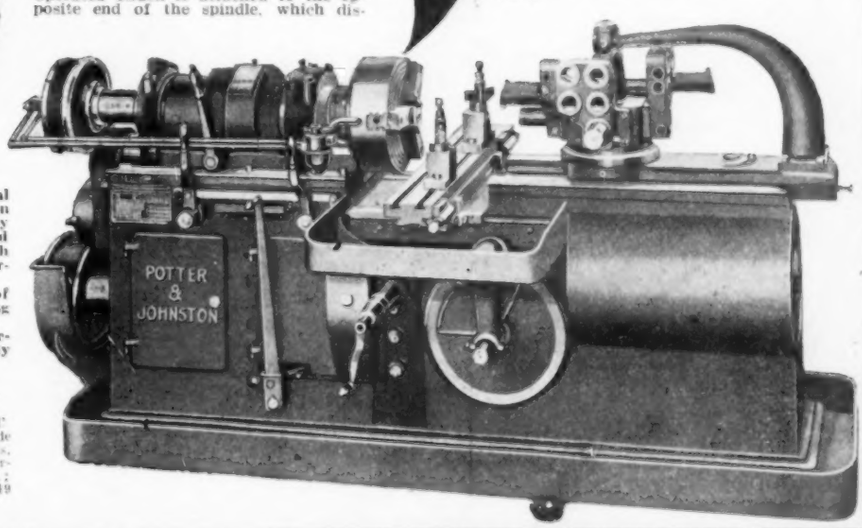
You will profit by its use fully as much as others have.

The Air Cylinder of the M. E. C. Air Operated Chuck is attached to the opposite end of the spindle, which distributes the weight uniformly on the headstock.

We realize the vital importance of the air cylinder with regard to this method of chucking, and we have constructed it accordingly.

The M. E. C. Air Cylinder is one of the reasons why work chucked with an M. E. C. Air Operated Chuck stays chucked.

Literature will be sent, postpaid, on request.

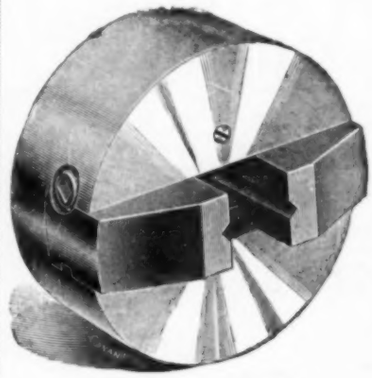


Consider This:

Suppose you have several P. & J. Automatics working in your shop. Do you realize how many MORE machines one operator could attend to if each was equipped with an instantaneous-acting "M.E.C." Air-Operated Chuck?
His work would then consist only of removing finished pieces, and putting in new.
Chucking would be reduced to a fraction of the time that would ordinarily be consumed by hand methods.

Manufacturers' Equipment Co.
Chicago, Illinois

New York Office: Grand Central Palace, N. Y. C.
AGENTS: William K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa.; William K. Stamets, Hickox Bldg., Cleveland, Ohio; West-Fisher-Buiwitt Co., Vernon Bldg., Detroit, Mich.; R. A. Braunberger Tool & Machinery Co., 549 W. Washington Blvd., Chicago, Ill.



Look at the Thrust Shoulders

They are of hardened Steel, and allow the screw threads to extend fully to the outside of the chuck giving the jaws greater traverse and increasing the safe capacity of the chuck. We make chucks for every service.

Write for catalog.

D. E. Whiton Machine Co.
New London, Conn.

Europe: Selson Engineering Co., Ltd., 85 Q. Victoria St., London.
"Whiton" Chucks are sold and kept in stock by principal dealers all over Europe.

"Wear-Ever"

The Quick, Positive Spacer for Milling Cutters

"Wear-Ever" Spacing Collars eliminate the delays between jobs. They have made the old practice of cutting paper shims obsolete in a large, constantly increasing number of big shops.

The "Wear-Ever" collar is adjustable in increments of .002 in. over a range of .024 in. There are no threads to cause trouble; adjustment is positive; faces are always true and parallel. Collar is thin and can be used in close quarters.

Sent on free trial

Scully-Jones Company
649 Railway Exchange Bldg., Chicago, Ill.

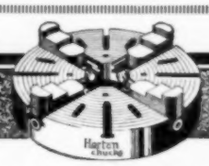
Ellison Hardened Body Chucks Stand the Stress and Strain

The unusual grip of Ellison Chucks means no slipping of drills and consequent burring up and marring of the shanks. This means drill economy.

To preserve the correctness in design we use the highest quality material and workmanship on every individual chuck.

Our descriptive circular, sent on request, will give you details as to capacities, and prices of these mechanically right chucks.

The American Machine Co.
104 Wellington Street, Hartford, Conn.



This advertisement in last week's issue tells more about the complete line and illustrates one of the eight leaders. A chuck for every chucking need and every chuck built for present-day usage.

THE E. HORTON & SON CO.
WINDSOR LOCKS, CONN.

109-2

Horton chucks

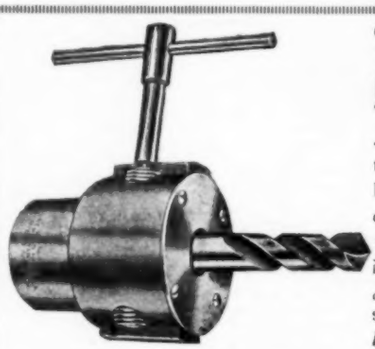
4 Reasons Why

you should use a "Woodstock" Improved Safety Tapping Chuck. 1st. Practically impossible to break a tap no matter how tough the operation.

2nd. They will work to full length of the tap or where threads are only one or two deep. 3rd. Made with or without Automatic Reversible Attachment. 4th. Sent on 30 days' free trial. New illustrated descriptive literature absolutely free and no obligation incurred.

PETER BROS. MFG. CO.
ALGONQUIN ILLINOIS

Messrs. A. A. Jones & Shipman, of Leicester, England, L'Outillage Mecanique, 16 Rue Dupont, De L'Eure, Paris, France, carry a complete line of these chucks.

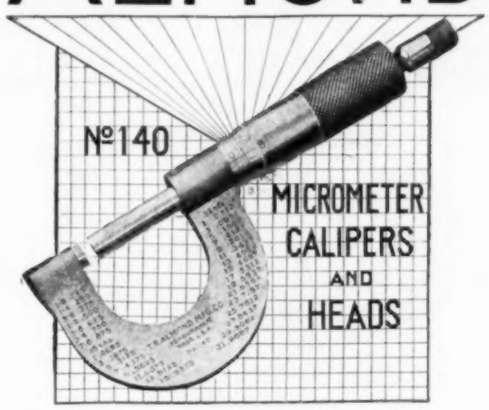


The Union Drill Chuck

A strong and substantial chuck—made of best materials, and a chuck that will wear well under severe service. Also has a *positive drive* feature that will save drills and insures *long life to the chuck.*

Union Manufacturing Co.
26 Cortlandt St., N. Y. **NEW BRITAIN., CONN., U.S.A.**
Makers of a Complete Line of Chucks

ALMOND



All Almond Micrometers are inspected and adjusted to Johansson Gages and recognize comparison only with these gages.

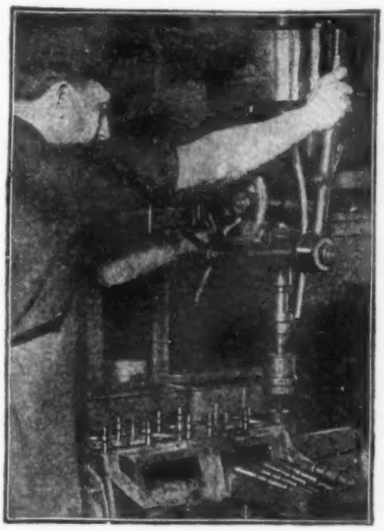
Almond Service—Should the Micrometer need readjusting at any time or defect in material or workmanship develop send to Ashburnham and readjustment or replacement will be made without expense.

OTHER ALMOND PRODUCTS

Drill Chucks, Right Angle Transmission, Lathe Chucks, Flexible Steel Tubing

T. R. ALMOND MFG. CO.
Ashburnham, Mass.

ERRINGTON



Quick-Change Drilling, Tapping, Studding Chuck

Style E. P.

This automobile crank case has 24 holes tapped and studded.

5 holes ⅜″ x 16″; 12 holes ½″ x 13″; 6 holes ¼″ x 20″ and 1—½″ hole for pipe tap.

These holes are tapped in 4 *minutes;* and the 24 studs are set in 3 *minutes,* with a total of 64 crank cases handled per each nine-hour day.

F. A. ERRINGTON, 39 Cortlandt Street, NEW YORK

130 West Lake St., Chicago, Ill. 82-A Old South Bldg., Boston, Mass.

A Lathe is no Stronger than the Chuck

and what good to a man is a chain with a defective link? There's a lot of consolation as well as practical economy in possessing something you know will not fail down on important work. You can rely upon a T-W Chuck every time.

T-W Chucks will help turn your repair men to actual production work.

Write today for Descriptive Catalog and Price List.

T-W INDEPENDENT LATHE CHUCKS

TERKELSEN & WENNBERG, 326 A St., Boston, Mass.

A Report On GARVIN Wrenchless Chucks

from a large brass goods plant advises a 50% reduction in cost by the use of these chucks. Is this not worth while investigating at your plant?

Two and Three Jaw Carried in Stock

For Further Information { Ask Your Dealer or Write Us Direct

Full description in Chuck Catalog.

The Garvin Machine Company

Spring and Varick Sts. 50 Years in New York City

No. 2 with Gin Brush in Position
(Patent applied for)

20th Century Balancing Tools

always level, no matter where or how you place them.

Twentieth Century Balancing Tools require no aligning or adjusting. They are light, portable, strong. They are an essential of every machine shop and polishing room.

Send for descriptive literature, which will tell you how inexpensive these tools are, and how little it costs to keep them.

Rockford Tool Company

Harrison Ave. and Eleventh St., Rockford, Ill., U. S. A.

Why Endure Boiler Scale and Waste Coal?

Do you realize that 1/16-in. depth of scale means a loss of from 10 to 15% in efficiency from a fuel standpoint? Get busy and call upon SOUTHER SERVICE to show you how to avoid scale and save coal.

The Henry Souther Engineering Co.
Consulting Engineers
11A Laurel Street, Hartford, Conn.

Phillie Gear Says—

"And the One That Got Away Was This Big"

"Yes, sir, that is the actual truth, and I am as happy as a clam at high tide.

"These little gears here in front of me are the last of a big rush order that was routed to be shipped today.

"That order called for gears of several sizes and some were mighty peculiar styles. The time was short because some of them were needed for a breakdown.

"We shipped a number of medium-sized ones just before lunch and the big herringbone—the one I'm happy about—just got away by express."

This is typical Gears Philadelphia enthusiasm. Phillie specializes on pleasing customers. His quality gears are known wherever wheels turn and when the emergency comes, he's with you till the end.

Many sizes and styles of gears are carried in stock for immediate shipment. Others, according to size, can be cut and shipped within 24 hours.

If you don't know Gears Philadelphia Service you have been losing money. Try him on that next job and you'll know what it means "to deliver the goods."

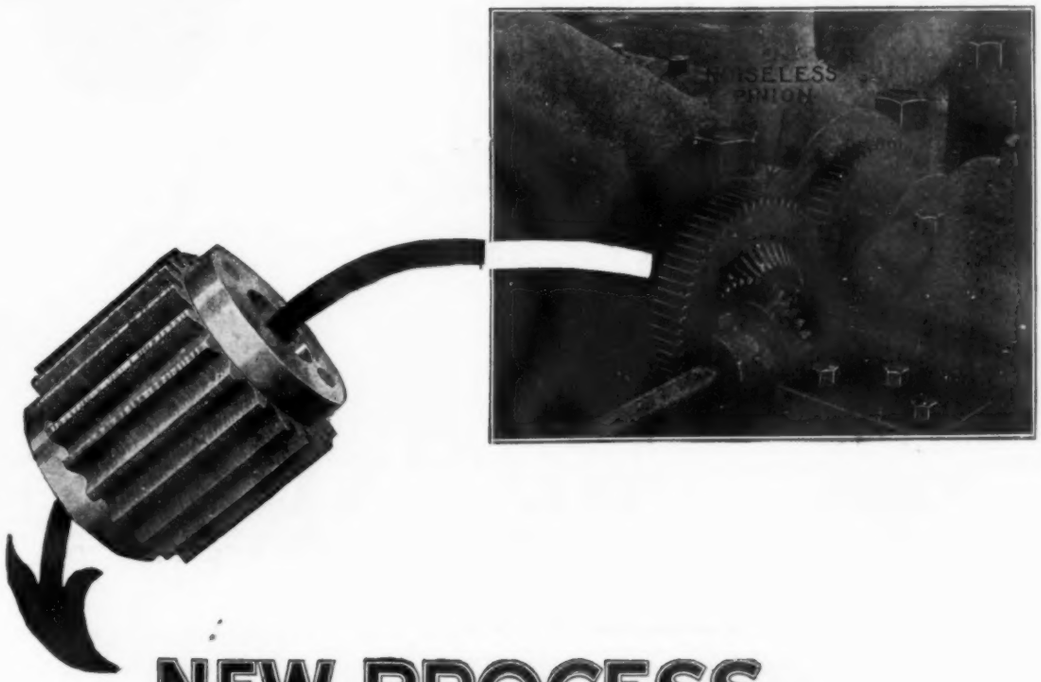
The Phillie Gear Book is a big aid to those who order gears. It enables you to plainly tell just what you want—saves time—prevents error. Send in a request for a copy. It comes with our good will.

Spur — Bevel — Mitre — Spiral — Worm — Helical

Philadelphia GEAR Works, Phila. Pa.

Sprockets — Racks — Rawhide — Micarta — Gears

and on Oil and Gas Engines—



NEW PROCESS RAWHIDE PINIONS

when applied to the governor-driving mechanism prevent the varying speed of the engine from causing any clatter in the gears.

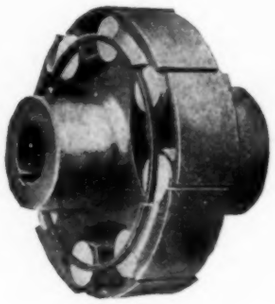
Their quietness permits detection of trouble noises

THE MEACHEM GEAR CORPORATION

Sole manufacturers of *new process* RAWHIDE GEARS and PINIONS—still made under the direction of the inventors and the men responsible for every stage of their development

Canal Street and West Shore Railroad, Syracuse, N. Y.

SPEEDY?



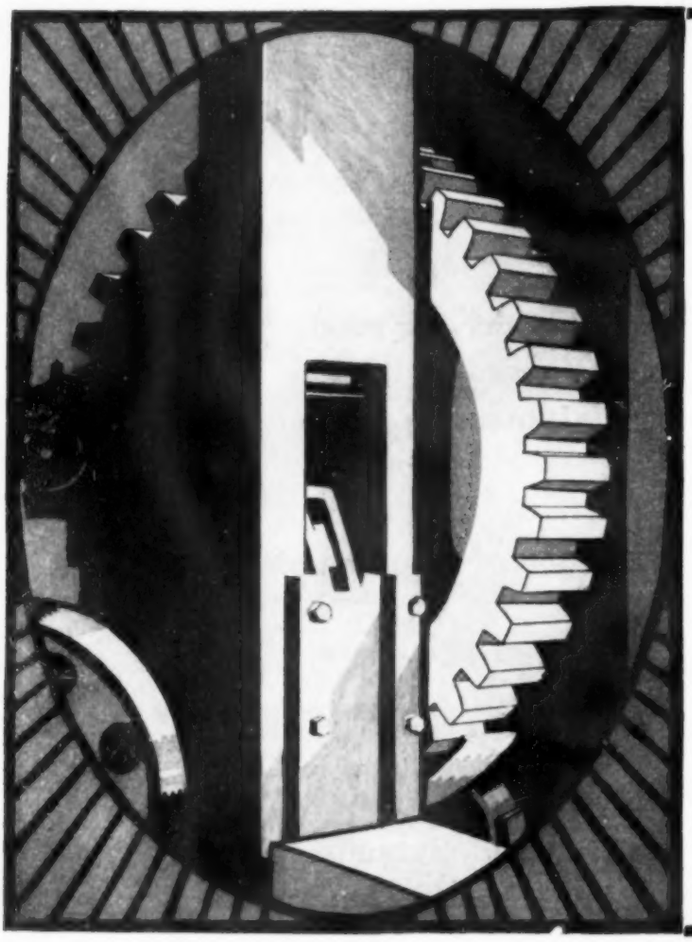
Do you know that the Nuttall Type A Flexible Coupling is light and strong and manufactured for light, speedy applications?

Investigate the Type A thoroughly when you need a flexible coupling because it has proved itself to be a good one.

R. D. NUTTALL CO.
Pittsburgh, Pa.

MEMBER OF AGMA

Nuttall Gears
EVERY GEAR REGISTERED



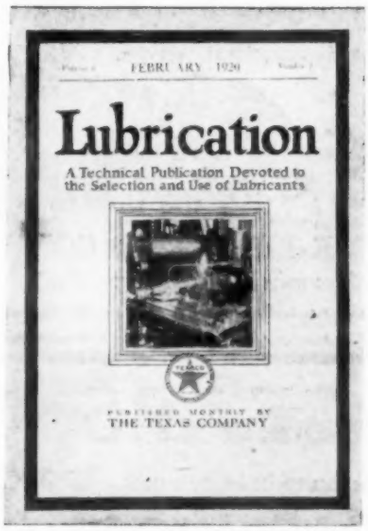
FOOTE DEPENDABLE GEARS

will insure dependable working machinery

Foote Dependable Gears are made to stand the severe service and abuse to which gears are necessarily subjected. They are accurately made, of high quality materials, carefully tested and rigidly inspected.

Foote Bros. Gear & Machine Co.
Mfgrs. of Cut Gears for All Purposes
Send for Catalog
242-252 N. Curtis St.
Chicago, U. S. A.

Every department in your plant which uses oil, can be adequately served by Texaco Lubrication Service


FEBRUARY 1920
Lubrication
A Technical Publication Devoted to the Selection and Use of Lubricants
PUBLISHED MONTHLY BY
THE TEXAS COMPANY

And that goes for everything—from the line shafting bearings overhead to the gears of the stoker in the fire room—

And it includes everything between, whether it be prime mover or machine, whether operated by steam, electricity, gas, or air.

There is a Texaco Lubricant for every purpose.

And Texaco Lubrication Engineers, through their experience, are qualified to recommend the right lubricant for every conceivable class of machinery.

That is why so many manufacturers of machines, after co-operating with us, see fit to recommend Texaco Lubricants for use on the machines they make and sell.

Are you receiving "LUBRICATION" each month?

In this magazine we print each month a leading article dealing with the practical problem of lubrication applied to various industries—on different kinds of units, on different kinds of machines.

"Lubrication" is a part of Texaco Service—and is sent *free* to engineers, oil buyers, executives, and all others interested in the subject.

We invite you to become a subscriber to "Lubrication."

Here's the Coupon that brings it

THE TEXAS COMPANY

Dept. A3, 17 Battery Place, New York City

Kindly send me Free, each month, your magazine "LUBRICATION."

.....

.....

.....

624

GRANT GEARS

accurately cut in cast iron, steel, brass, rawhide and fibre.

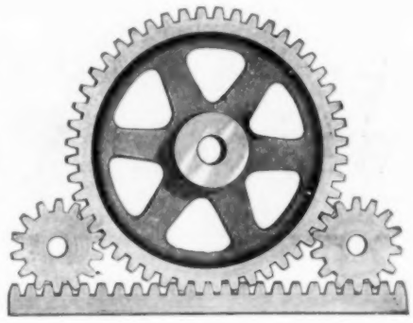
Our large new factory equipped with the very latest gear cutting machinery and a works organization that is backed by 40 years' experience in gear cutting enables us to meet every possible gear requirement from mill pinions to wheels 6 ft. in diameter.

We are prepared to give immediate attention to rush orders and can make prompt shipments on any special type of gearing.

Large stocks of standard cut gears constantly on hand, ready to be shipped at once.

Send us your blueprints for estimate. Let us solve your gear problems.

Write for interesting catalog containing full stock list and valuable gear information.



Grant Gear Works, Inc.
151 Pearl St. Boston, Mass.

Zones of Quiet GEARS

Perhaps your product would be improved by the use of "Zones of Quiet" Gears. Their noticeable smoothness in operation and absence of harsh, grinding gear noises always attract favorable attention and mention of the finished article on which they are used. We make—

Spur, Helical, Bevel, Mitre, Spiral, and Worm Gears and Worm Wheels in all metals — also in Bakelite

Capacity — 10,000 Finished Gears Daily

If interested, send blue print or sample Gear for estimate

AD ALBAUGH-DOVER CO.
2100 Marshall Blvd., Chicago

Re: Deliveries

Just write or wire—what you want and when—We'll do the rest.

Equipped as our shop is we are in a position to offer exceptional service. Try us.

Estimates will receive immediate attention. No delay.

CARPENTER-TEW GEAR COMPANY
Bush Terminal, Brooklyn, N. Y.

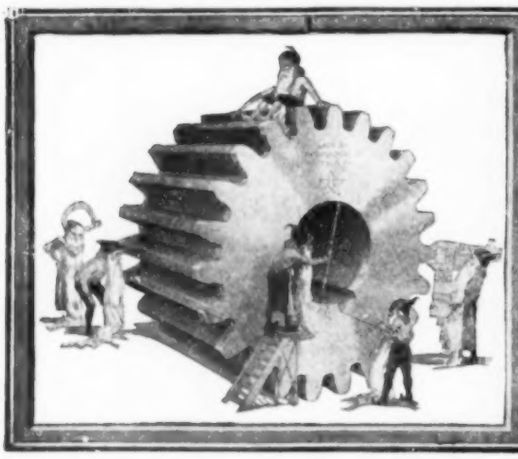
GEARS

help production to its highest peak. CROFOOT GEARS help production *up* by means of precise meshing and full value in durability and service.

Make your next investment in gears an economical one. *Our engineers can help you.*

Crofoot Gear Works, Inc.
30 Ames Street, Cambridge 39, BOSTON, MASS.

Trade Mark



GANSCHOW

"QUALITY"
RAWHIDE AND BAKELITE
PINIONS
WILLIAM GANSCHOW COMPANY
CHICAGO ILLINOIS

Stop that Chattering! INSTALL

Cincinnati Gears

There is no excuse for chattering because of gears that fail to mesh, or that haven't lasted the way they should. Cincinnati Gears have proved that gears can be made to run quietly, without lost motion, and without wearing out before their allotted time.

With this gear excellence goes Cincinnati Gear **service**—prompt shipment, all sizes and styles, and reasonable prices. Many plants leave the gear question up to us entirely—they have found us gear specialists that know gears from A to Z.

Try us. A postal will do.

The Cincinnati Gear Co.
1825-27-29-31-33 Reading Road, Cincinnati, Ohio

B&S GEARS

Backed By Over
Fifty Years Experience

and produced by highly skilled workmen on the most up-to-date machines.

Brown & Sharpe Gears

represent the highest form of precision gear cutting.

Spur Gears
Worm Gears
Worms and Racks
Spiral Gears
Bevel Gears
Angular and Circular Bevel Gears

cut to your order. Send specifications and blueprints for prompt quotation.

Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

No Gear Too Large

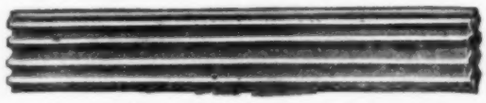
No matter how big the gears you want may be we can make them for you. We are specialists in the cutting of large worms, odd size gears of every kind and special shapes. We take equally good care of the smaller sizes, and our service in all cases is unusually prompt.

Write for estimates

NEWARK GEAR CUTTING MACHINE CO.
HENRY E. EBERHARDT, President
69 Prospect St., Newark, N. J., U. S. A.

STANDARDIZED BOSTON GEARS

300,000 In Stock



1200 Sizes

Straight pinion wire, cut by the hobbing process, free from twist and teeth evenly spaced; miters and bevels cut by the generating-planed process giving the most bearing obtainable in this style; and worms and worm gears smooth cut with concaved faces are some of the reasons why STANDARDIZED BOSTON GEARS are the best.

BOSTON GEAR WORKS, Norfolk Downs, Quincy, Mass.

CHICAGO BRANCH: 623-5 W. Washington Blvd.

Peerless

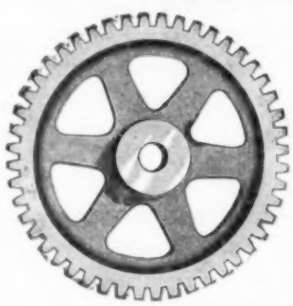
Rawhide Gears

Silent, Long-lived, Economical

Send Us Blue-Prints or Sample Gears for Estimates.

The Horsburgh & Scott Co., Cleveland, O

SPUR GEARS



Cut to order up to 10 in. diameter

We are equipped to furnish gears in large or small quantities. If you want quick deliveries and accurate work, write or wire.

NATIONAL MACHINE & TOOL CO.
253 A Street, Boston

Yes, it's possible to have your gear orders filled quickly

Not only possible but probable if they are

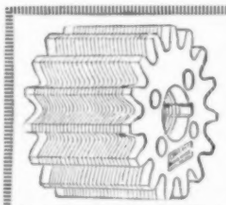
Meisel Gears

For speed and quality, it's to your advantage to send that next gear order here.

Screw Machine products, too, up to 5-in. diameter.

Meisel Press Mfg. Co.
946 Dorchester Ave
Boston, Mass.

Reg.



Chicago-Rawhide Pinions

Only the best of material and the highest type of workmanship goes into the making of Chicago-Rawhide Pinions.

Quotations will be gladly furnished on request.

The Chicago Rawhide Mfg. Co.
1301 Elston Avenue, Chicago, Ill.

Agents for England: The British Rawhide Belting Co., Ltd., Hythe Road, Willesden, London, N. W.

M-C GEARS

are accurately generated on our hobbers.

Let us cut your gears.

Meisselbach-Catucci Mfg. Co.
28 Congress Street Newark, N. J.

CULLMAN
Sprockets and Chains

In stock and to order. Send for Catalogue.

CULLMAN WHEEL COMPANY
1349 Altgeld St., CHICAGO, ILL.

GEARS QUICKLY CUT TO YOUR ORDER

All kinds, all sizes, will be cut to your specifications without delay. Our modern equipment and live organization are at your service.

Send us your blue prints if you want High Quality Cut Gears made promptly.

Union Gear & Mach. Co., 27 Purchase St., Boston, Mass.

HERRINGBONE CUT GEARS

MILL DRIVES SPEED REDUCERS

FAWCUS

SPUR WORM BEVEL GEARS

FAWCUS MACHINE CO. PITTSBURGH, PA.

Cut and Planed Gearing

of every description.
Let us remedy your gear troubles.
Special attention to rush work.
Accurate work and honest delivery promises.

The Simonds Manufacturing Co.
Pittsburgh, Pa.

EFFICIENCY ON WHEELS

Efficiency is the ratio between useful work and energy expended.

"New Britain" Truck Type Work Stands are doubly efficient because they combine the handiness of a work stand with the mobility of a small truck.

For conveying goods in process of manufacture from one department to another without rehandling—for collecting small parts for assembling or shipment—or for transporting the tools of a repair man from one machine to another—this work stand is unexcelled.

The objects which make up the load are plainly visible, and need not be sorted at their destination, and the combination of ball-bearing, quick-facing casters in rear, with large wheels and dead X in front, renders mobility in cramped quarters comparatively easy.

Let us tell you about this and other time- and labor-saving articles of shop furniture.

May we send our complete catalog?

***The* New Britain Machine Co., New Britain, Conn., U.S.A.**

Designed for Greatest Utility

Built for Longest Service

Victory Wash Bowls

Common Water Supply
Common Waste
Common Vent

Compact and Portable.
The Vent is the Top Pipe.

One of the types of wash bowls manufactured by us

Meets Most Exacting Plumbing Regulations

Latest Plumbing Construction
Practical, Efficient

Our Lines Include SANITARY WASH BOWLS (in Batteries), BUBBLING FOUNTAINS (Plain and Ice Cooled), METAL LOCKERS, METAL STOCK AND PATTERN STORAGE RACKS, METAL SHELVING, METAL CABINETS, VAULT FIXTURES, SODA KETTLES (40 and 60 Gallons), METAL STOOLS AND CHAIRS, WATER MIXERS, WORK BENCHES, BENCH LEGS, FULL LINE OF PLUMBING FIXTURES, Etc.

Manufacturing Equipment and Engineering Co.

Boston, Mass.

Works and Mail Address, Framingham, Mass.

WICKES
BLUE PRINT SYSTEM
SAGINAW · MICHIGAN

Prints Clearly and Distinctly. And It Is Easier to Operate and Cheaper to Maintain

AN accurate plan and a clean, instantly interpretable blue print (every dot, line and figure vividly distinct) are the parents of every enduring structure either small or great.

The Wickes Blue Print System is always accurate and true. It prints clear and distinct, free from blotches and faded lines which assures a true, perfect blue print.

Let us send you catalogue.

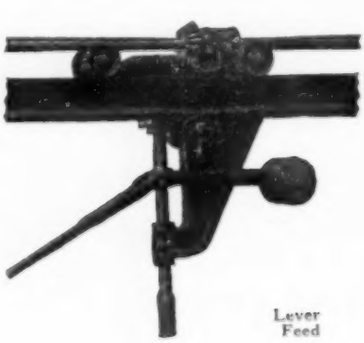
Built by

1856 **WICKES BROTHERS** 1920

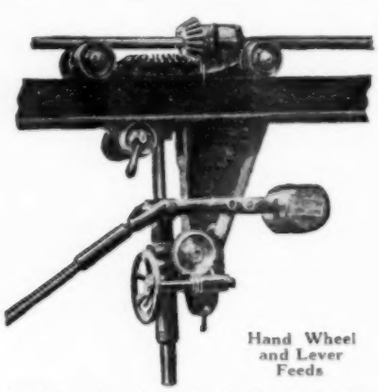
2206 Water Street, Saginaw, Mich., U. S. A.

Heavy Duty Plate and Structural Tools, Heavy Duty Engine Lathes, Special Production Lathes and Crankshaft Turning Equipment, Blue Print Machines.

CLEVELAND
Wall Radial Drills



Lever Feed



Hand Wheel and Lever Feeds

Hand Wheel Lever and Automatic Feeds

For reaming and countersinking the drill is built with lever feed only and with hand wheel or automatic feeds with quick return for drilling. The lever feed is always included with the hand wheel feed, and the automatic feed includes both lever and hand wheel feeds.

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Main Office & Works · CLEVELAND, OHIO
PITTSBURGH CHICAGO NEW YORK

Peerless HIGH SPEED

Establishing a Precedent; Not Following One

Because of its ability to make heavy cuts, because it is economical on blades, and because it works faster, better, and more accurately, the Edison Electric Appliance Co., of Chicago, has standardized on the "Peerless" High Speed Metal Saw.

A large amount of every grade of tool steel is used by this concern. To find which machine was the very best for their needs, many different makes of metal saws were examined and tested.

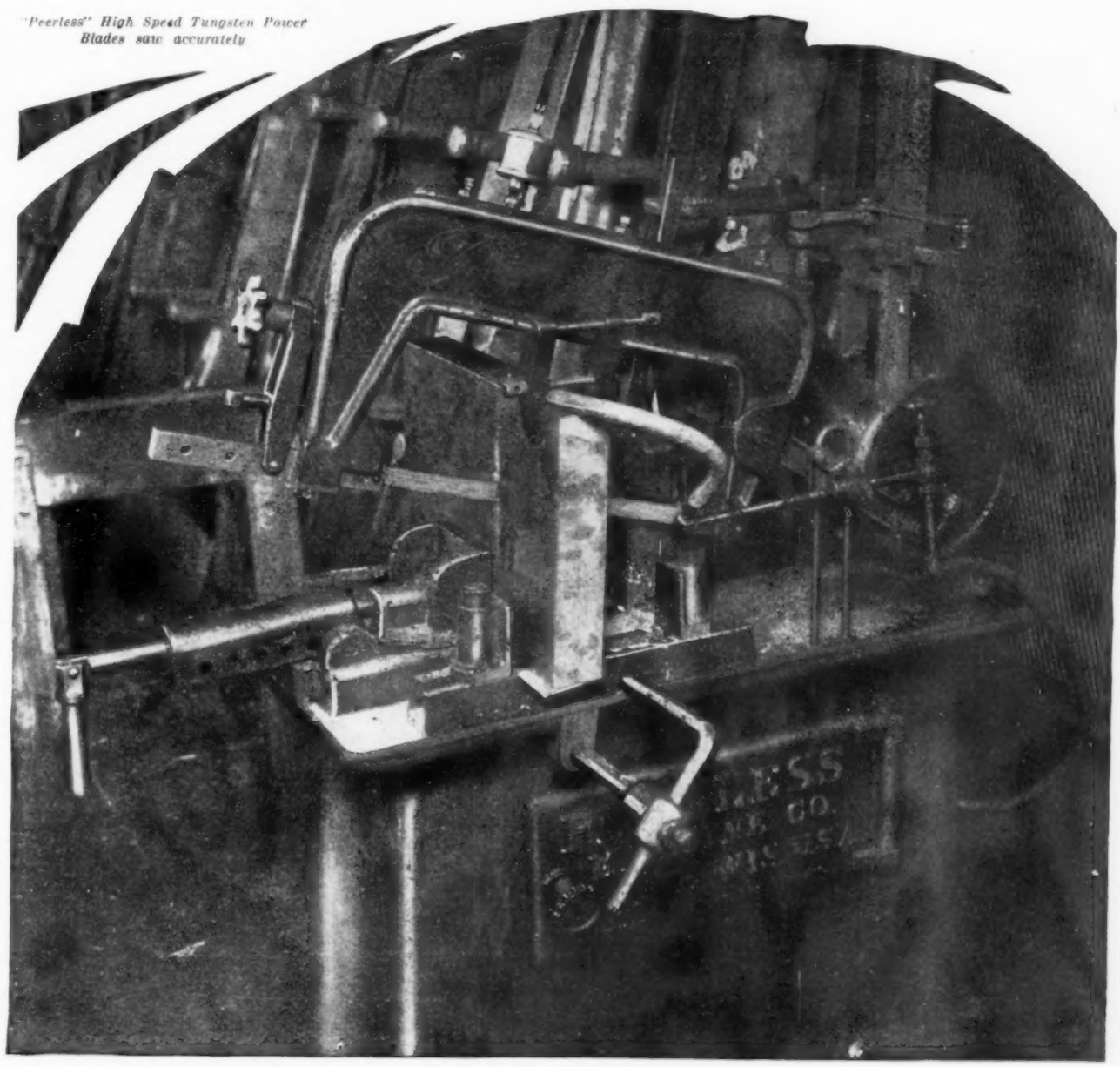
In the end the "Peerless" was chosen.

This, we think, serves to prove that the "Peerless" *is* a better machine. And you will undoubtedly find that it will serve you fully as well in your own plant, as it has served many hundreds of others.

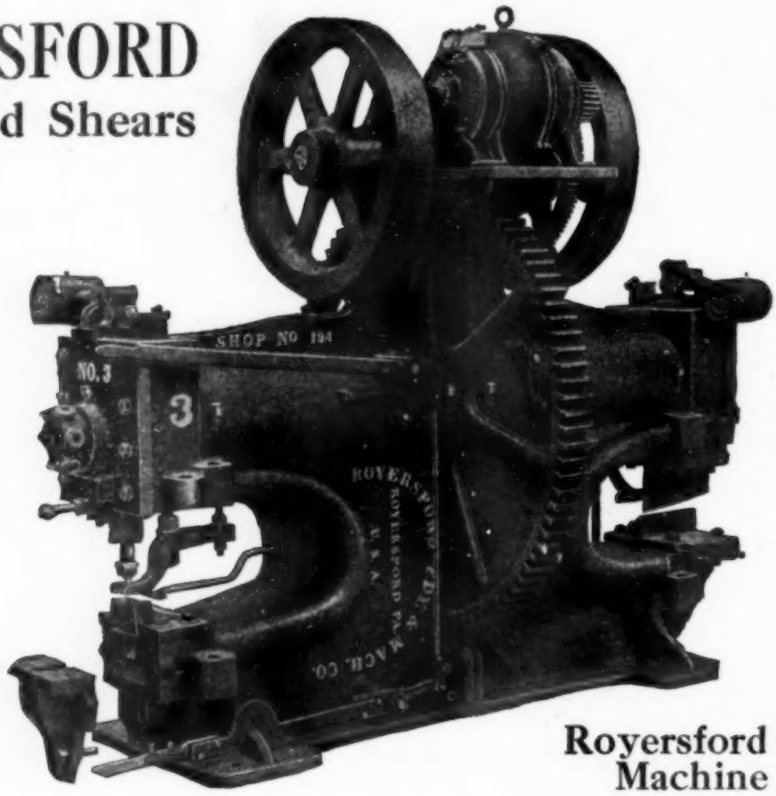
Literature on request.

PEERLESS MACHINE COMPANY
1615 RACINE STREET, RACINE, WISCONSIN

"Peerless" High Speed Tungsten Power Blades saw accurately



ROYERSFORD
Punch and Shears



Write for Catalog

Motor or Belt Drive

Royersford Foundry & Machine Co., Inc.
Factory: Royersford, Pa.

Swind Cutting-Off Machine

Automatically Finds Its Correct Cutting Speed for Each Job

The correct saw speed may mean the difference between costly and low cost production. This machine finds it automatically. Compact and highly efficient. Capacity up to 3¼-in. rounds.

Send for Circular No. 50

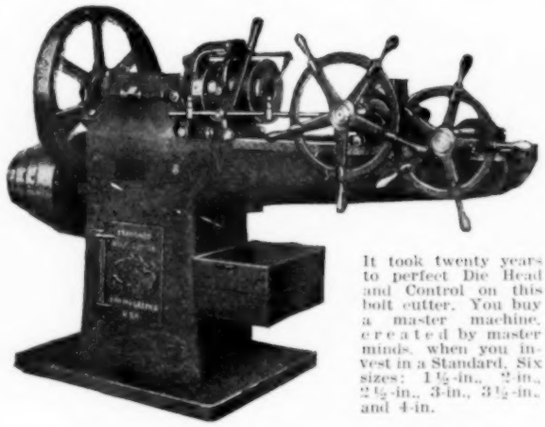
Swind Machinery Co., Philadelphia, Pa.

Dies Set to Exact Size At Will of Operator

The micrometer adjustment of the Standard Bolt Cutter is so sensitive that bolts may be cut over or under size, and dies set to again cut exact size at the will of the operator while machine is running. A graduated index eliminates errors. Dies open and close without affecting adjustment.

Write for full data on this machine

The Universal Machine Co.
Pike Street, Bowling Green, Ohio



It took twenty years to perfect Die Head and Control on this bolt cutter. You buy a master machine, created by master minds, when you invest in a Standard. Six sizes: 1½-in., 2-in., 2½-in., 3-in., 3½-in., and 4-in.

THE "RACINE"

"Standard the World Over"

Economy and Speed

Economy is linked with speed in "RACINE" high speed metal cutting, due to the perfection of "RACINE" design.

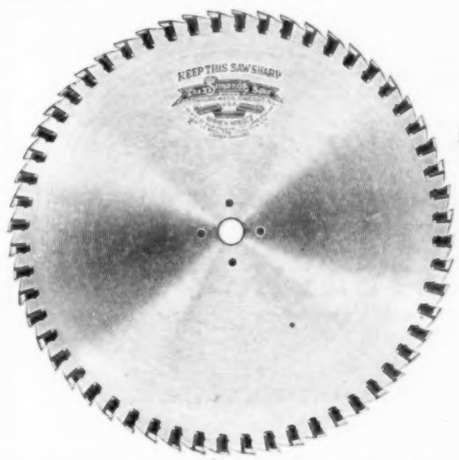
Positive and automatic lift of the blade on every return stroke is only one of THE "RACINE" features making for better, faster and most inexpensive metal cutting.

The saving due to longer blade life is well worth your consideration when selecting high-speed metal cutting equipment.

Ask for the complete details.

Use "RACINE"
H. S. Tungsten Blades

The Racine Tool & Machine Company
1400 Jones Ave., Racine, Wis., U. S. A.



SIMONDS
METAL SAWS

Quality, Durability and Cutting Service are combined in Simonds Metal Cutting Saws. These saws are made by first-class mechanics and are of quality steel from our own steel mills. Simonds Inserted Tooth Metal Saws are started right and finished right. You will find them in all parts of the world giving satisfaction on all kinds of metal cutting jobs.

Write for prices.

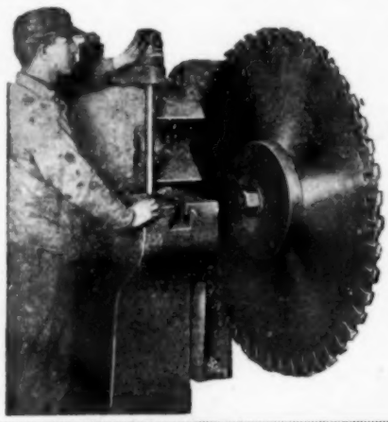
Simonds Manufacturing Co.
"The Saw Makers"
Fitchburg, Mass.

Chicago, Ill.	New Orleans, La.	Montreal, Que.
New York City	San Francisco, Cal.	Memphis, Tenn.
Portland, Ore.	Vancouver, B. C.	Seattle, Wash.
Lockport, N. Y.	London, England	St. John, N. B.

Lea-Simplex Cold Saw

—the cost is surprising in view of its speed

The Earle Gear & Machine Co.
4701 Stenton Ave., Philadelphia



This Hunter For Heavy Duty

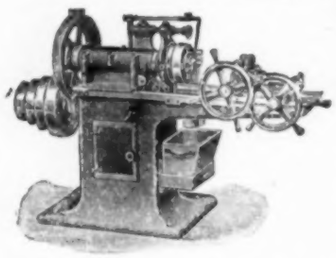
This inserted cutter saw was designed to do the heaviest sawing work most economically. It will save its cost ten times over the solid saws of the same type.

We also manufacture and carry in stock a full line of rivet sets and chisel blanks.

Catalog on request

Hunter Saw & Machine Co.
Pittsburgh, Penn.

Bolt Cutting At Higher Speeds



Many ingenious devices add to the working range and speed of the Acme Bolt Cutters.

Power is transmitted to working parts in a way to cut out the lost motion, thus making every movement productive without unnecessary wear.

All materials are the best for its service.

Write for Catalog which shows our complete line.

The Acme Machinery Company
Cleveland, O., U. S. A.

VICTOR HACK SAWS

VICTOR HACK SAWS

Get a box and try 'em.

VICTOR SAW WORKS

SPRINGFIELD, MASS., U.S.A.

The HIGLEY Cold Metal Saw

Catalog will be sent on application to

Vandyck Churchill Company
93 Liberty Street, New York

"MILFORD" HACK SAW BLADES

MILFORD

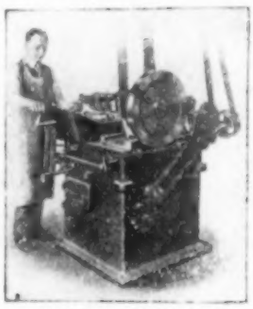
"Go By The Name"

Sample sent on request.

The HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

HACK "STERLING" SAWS

Diamond Saw & Stamping Works, Buffalo, N. Y.



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Hex Milling Machine

Reduce Production Cost with a Sanford

If you are confronted with difficult hex milling problems, investigate the Sanford Hex, Semi-Automatic Milling Machine. It is a modern invention to hex mill spark plugs, lock nuts, steam valve heads, caps, etc., and reduce production cost. Request our Catalog.

F. C. Sanford Mfg. Co.
Bridgeport, Conn.

This Tag Is Your Guarantee
on a full line of machine tools, and machinists' and machine shop equipment.
Let the pooled stock of 24 Branch Houses supply your wants.

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Administrative Offices, New York.

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SOLVE THE PROBLEM
CUT DIES AUTOMATICALLY
BY THE KE METHOD

Keller Mechanical Engraving Co.
76 Washington St., Brooklyn, N.Y.

Automatic Feeding Marvel

The Marvel No. 5 High Speed Saw will automatically feed the stock to the machine. It will make a complete cut and then be back in place for the next in less than 15 seconds.

Booklet on request

Armstrong-Blum Mfg. Co.
347 N. Francisco Ave.
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Hercules

Shears and Rod Cutters

will help you to speed up production, always ready for instant use, no tools to adjust, belts to sew, or pull on the power plant. Rods can be cut off leaving ends suitable to thread or spin over forming rivet head without additional machining.

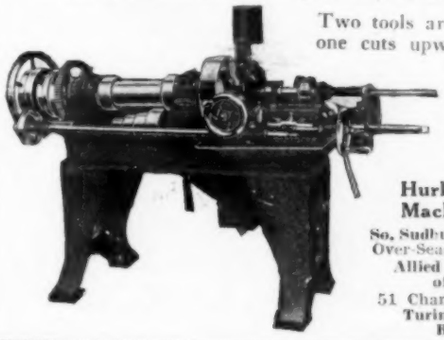
Shear Catalog No. 10

W. A. & C. F. TUCKER
Hartford, Conn.

Nos. 1-2 x 5

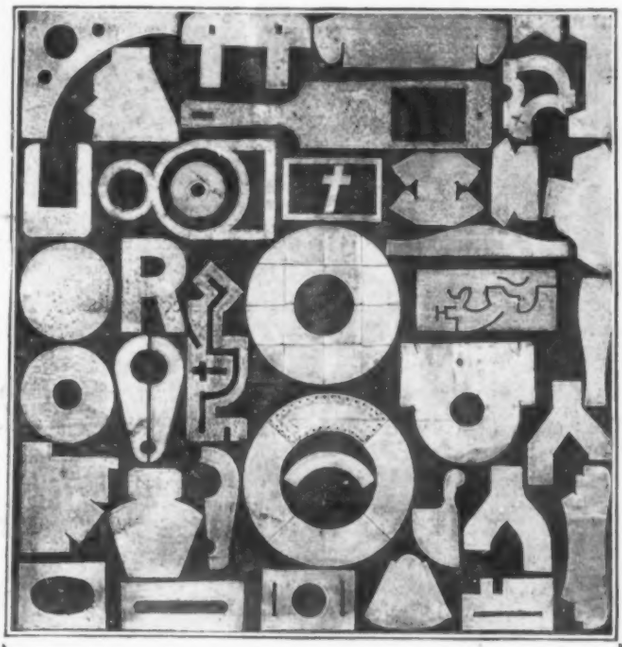
A Double Cutter

on the Hurlbut-Rogers Cutting Off and Centering Machine



Two tools are in operation, one cuts upward, the other downward. The centering operation goes on simultaneously

Hurlbut-Rogers Machinery Co.
So. Sudbury, Mass., U.S.A.
Over-Seas Representative
Allied Machinery Co. of America
51 Chambers St., N. Y.
Turin, Zurich and Barcelona



Cuts Any of These Shapes

And then a few others. If you want any shape whatever cut from metal the

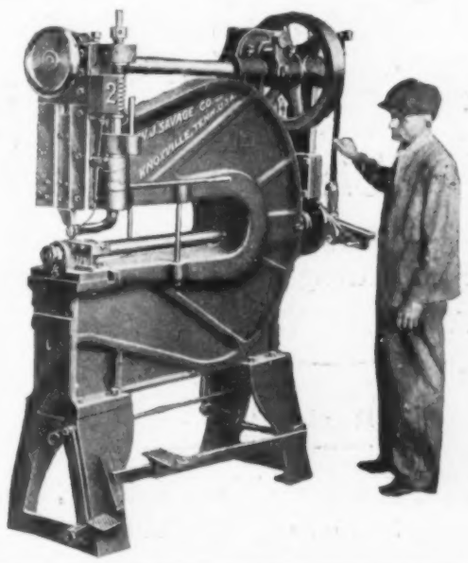
GRAY'S Sheet Metal Cutter

will cut them for you.

The Gray's Sheet Metal Cutter automatically feeds the sheet metal through the cutters while the operator simply guides it. This feature saves a great deal of time and labor and make this machine most economical for the production of sheet metal parts of any description.

We will be glad to send you our catalog

W. J. Savage Company, Inc.
Knoxville, Tenn.
European Agents: Alfred Herbert, Ltd., Coventry, England



Power!

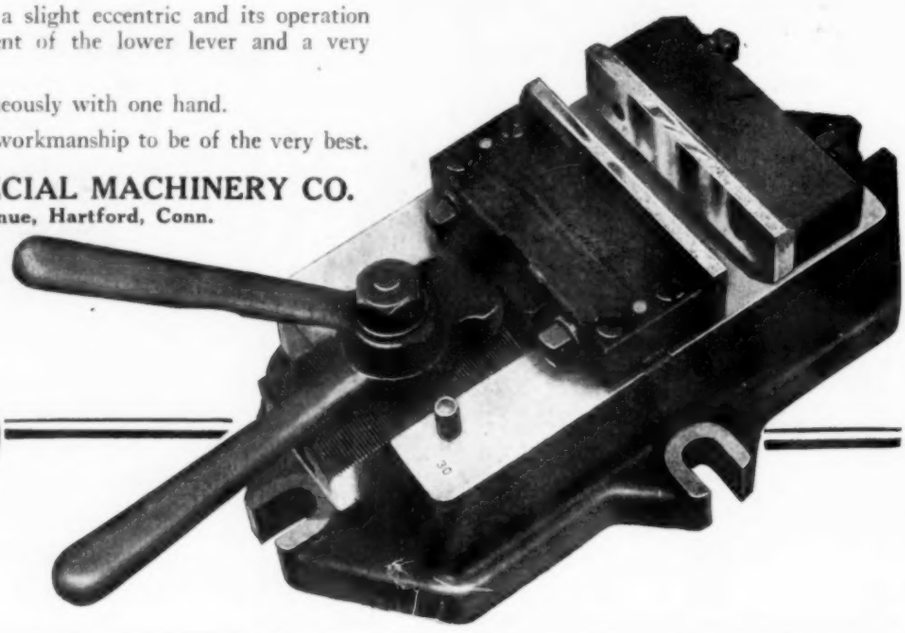
The lower lever acts like a cam and produces the quick opening and closing of the jaws.

The upper lever is mounted on a slight eccentric and its operation causes a slight forward movement of the lower lever and a very powerful resultant grip.

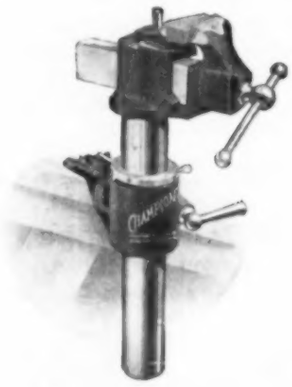
Both levers are operated simultaneously with one hand.

We guarantee the materials and workmanship to be of the very best.

THE HARTFORD SPECIAL MACHINERY CO.
280 Homestead Avenue, Hartford, Conn.



HARTFORD SPECIAL
The Shop of a Hundred Experts
MACHINERY COMPANY



Champion Shop Vises

a sturdy well made vise that is sufficiently strong to guarantee long life.

Full Line of Machinists' Vises.

Send for our booklet
It gives the details

The Western Tool & Mfg. Co.
Springfield, Ohio, U. S. A.

New Britain Universal Vise

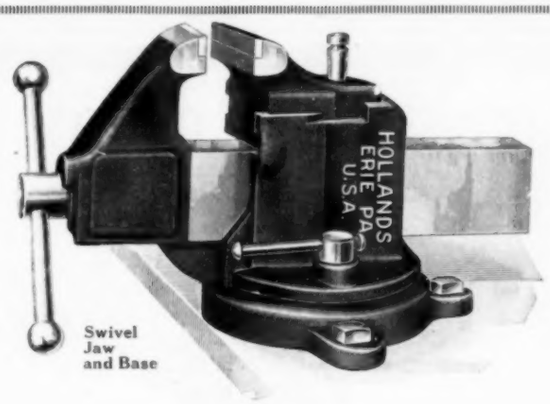
has many uses

The New Britain Universal Vise has unlimited possibilities for tool room use. It gives any angle, or compound of angles, that your mechanics may desire. Swivels 360 degrees horizontally and 100 degrees vertically. Its working surfaces are ground to limits, thus assuring accuracy. It is strong and will stand years of shop abuse.

Vise Opens 3¾ inches.
Jaws 1½ x 5¼ inches.
Weight 55 lbs.

Investigate Immediately

NEW BRITAIN TOOL & MFG. CO.
New Britain, Conn.



Hollands Vises

—have a record of over thirty years' satisfactory service.

Our Catalog No. 24 will give detailed information

HOLLANDS MFG. CO.
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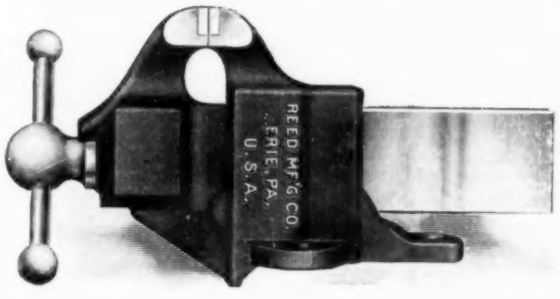
REED



Strongest and Last Longest

We are so seldom called upon to replace broken parts of Reed Vises that the repair part of our business is practically nothing.

Send for catalog

REED MANUFACTURING CO.
Erie, Pa.

Holding Delicate Work—Firmly

A vise which will take a good firm hold on any size block or some other such delicate piece and still not mar it, is truly a good vise.

STARRETT IMPROVED VISE

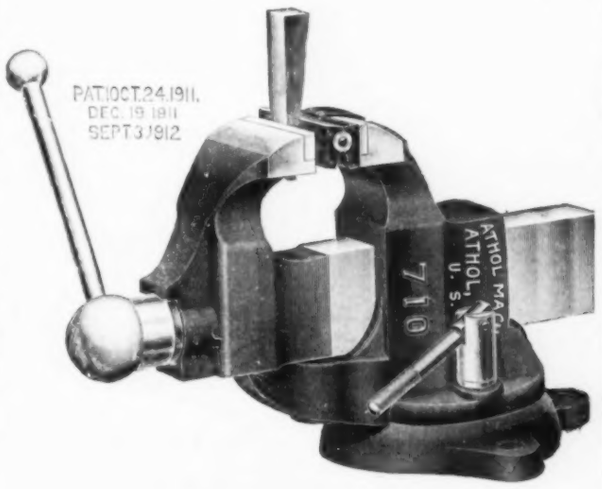
is constructed with a special buttress type screw so that but a very slight pressure is sufficient to securely fasten a piece of work. In fact you have ample power in your small finger to hold a piece of work unbreakably.

The swivel base and adjustable handle, both for convenience, come in handy on the lighter work.

Our catalogue will give you complete details of the application of this vise. Send for it.

Athol Machine Co.

Athol, Mass.



The Universal Angle Plate Has Micrometer Adjustments

Mr. Manufacturer, you need this tool in your factory.

By using it you eliminate 95 per cent of your workman's liability to set his work incorrectly, because he has no calculations to make and does not have to be familiar with the use of the Sine Bar. All he has to do is set each rotating part to the angle the work requires, at the degree which is plainly marked on the Universal Angle Plate.

Our folder will give you all information. Send for a copy.

Boston Scale & Machine Co.

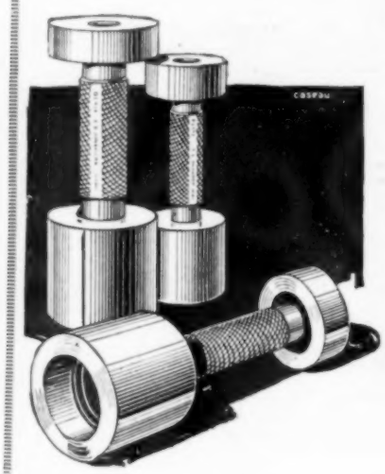
100 Ruggles St., Boston, Mass.

Agents for Great Britain, Belgium, Italy, India, Japan, Formosa and Korea: Alfred Herbert, Ltd., Coventry, England.

Saving $.00091

On Every Hole Gaged

Whereas the initial cost of the ordinary Plug Gage made in the machine shop is less, the longer life due to the treatment of the steel and superior finish given Johansson Plug Gages together with their reversible feature, make them more economical tools in the end.



An interesting blueprint of the comparative cost per hole of the two types of gages shows how a manufacturer saves $.00091 on every hole inspected by using Johansson Reversible Tolerance Plug Gages.

A copy of this blue print sent on request.

C. E. Johansson, Inc.
Poughkeepsie, N. Y.

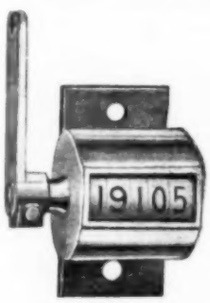
Johansson ACCURACY

Best-Liked Supervision

Labor-relations are better where there's less "bossing" of the operatives; where machine-operations are *automatically* watched over by

Veeder COUNTERS

The worker at a Veeder-equipped machine knows the output he's responsible for, and seldom needs supervision beyond the presence of his counter.



The small ***Revolution Counter*** at left counts the output of machines where a shaft revolution indicates an operation. This counter, though small, is very durable; its mechanism will stand a very high rate of speed, such as required on many types of light machines. If run backward, the counter substracts. Price $2.00. (*Cut nearly full size.*)

Write for the new Veeder booklet.

The Veeder Mfg. Co.

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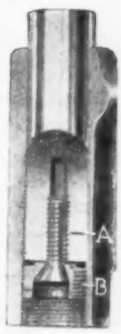
SYRACUSE GAUGES

One positive adjusting and sealing point. A simple foolproof method of setting and sealing is made possible by the

IMPROVED LOCKING MECHANISM



No exposed Screws or Surface Seals

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MELDRUM SIMON GREINER LOWRY

COMPANY, INC.

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Successors to LOWRY KNISE TOOL CO.

Bicknell-Thomas
Friction Tapping Chuck

Instead of permitting your operators to continually break taps and waste expensive time getting the broken stub out, why not equip your lathes and drill presses with Bicknell-Thomas Friction Tapping Chuck.

Our catalog gives complete details

Send for a copy

Bicknell-Thomas Co.
Greenfield, Mass.

Eye Insurance

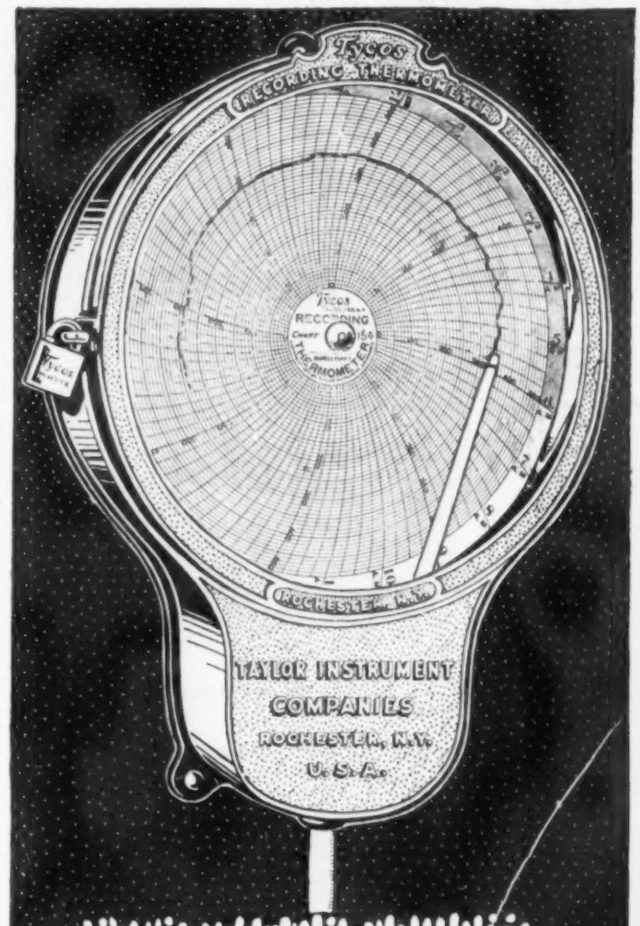
A scale graduated in thousandths with divisions ⅛ in. apart makes it easy to read the

Ideal Universal Test Indicator

It is the *ideal* instrument in every feature. Substantially made of bronze and steel. Compound levers. Contact point can be swung full 90 deg. on either side of indicator. No nuts or screws to loosen and a patented device prevents contact point from injury under pressure.

If you regret the $3.50 you pay for this instrument you may have it back.

Johnson & Miller, 42 Murray St., New York



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Taylor Instrument Companies
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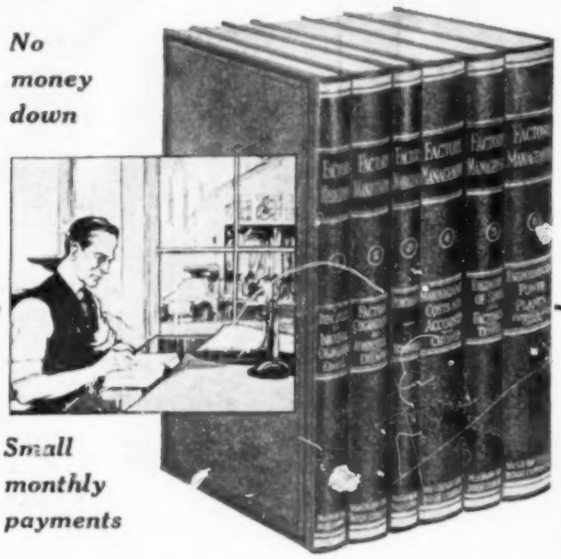

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What you will be five years hence depends on what you are doing now to train yourself for bigger responsibilities.

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Two Sizes

For Turret Machines

Adjustable to knurl all work up to 2½-in. diameter.

Great Britain — Burton, Griffiths & Co.
France, Italy, Switzerland, Spain and Holland—Fenwick Freres & Co.

High Speed Drilling Attachment or

DRILL **SPEEDER**

Three Sizes

DRILL **VISE**

Three Sizes

With and Without Jig Attachments

Often used on miller, shaper or planer.

Send for circulars.

The Graham Mfg. Co.
Providence, R. I.

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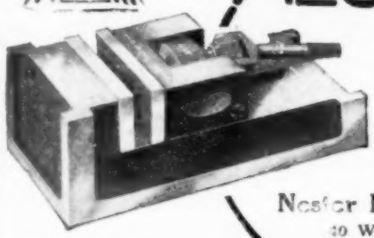

The quick-acting drilling vise that eliminates all need for changing position of work. To drill at right angles simply turn on side, or end. Time saved quickly covers its moderate cost.

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ALL STEEL LIFT TRUCK

The pioneer elevating truck that revolutionized factory trucking. Sold with a 5-year guarantee.

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THWING PYROMETERS

THERMO-ELECTRIC
RESISTANCE RADIATION
INDICATING AND RECORDING OUTFITS FOR ALL INDUSTRIAL PURPOSES

Thwing Instrument Company, 3337 Lancaster Ave., Philadelphia, Pa

Scleroscope
International Standard
(Hardness Tester)

HARDNESS TESTING
is now done almost exclusively with
The Scleroscope

DIRECT READING, can be operated by anyone with rapidity; measures softest metals and hardest steels without adjustment. Is the only instrument that properly agrees with others of its kind, and is used for ordering material to specification. Send for our booklet, free.

The Pyroscope

is the common-sense heat measuring instrument that makes straight for results, without fuss. It costs least of all, burns simple kerosene, never varies. It is the available trusty in the grimy hands of furnaceman, hardeners and carburizers. It is a pet in the laboratory, and preferred by colleges. Interesting bulletin free.

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Indispensable

—to skilled mechanic and apprentice alike. Prevent mistakes in your shop by equipping your men with the

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Get all the details in our bulletin. Write for a copy.

See your fit — don't feel for it.

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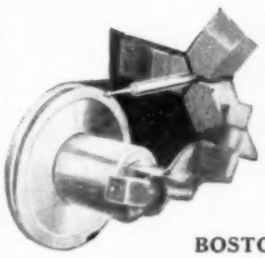
Union Tempered Steel Rules have clean-cut, accurate graduations that are easy to read.

All standard lengths and graduations.

UNION TOOL CO., Orange, Mass.

The Boston Wiggler
Finds the True Spindle Center Quickly



Here's a new Positioning Indicator. The Boston Wiggler, designed for use in finding the true spindle center on Milling Machines, Drill Presses and Lathes.

It will speed the work of "Laying Out" positions for holes, surfaces, etc., on jigs, fixtures and other kinds of work.

It does not matter how badly the chuck runs out, for the point of the ball on this "wiggler" is made to run true instantly.

Send for details today!

BOSTON TOOL & MFG. COMPANY
262 Dover St., Boston, Mass.

Shop Agents Wanted

The Productimeter

When you put a counter on one of your machines, you should be sure it is one that is particularly designed for that kind of a machine.

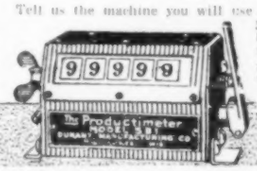
MORE THAN A "COUNTER"

Get a Productimeter, and you will get that assurance, for the Productimeter is a counter plus a **service**—a service that aims to give you a counter selected for the **results** you want. **Anyway, send for our Bulletin 33.**

30 DAYS' TRIAL

Tell us the machine you will use it on, and what kind of a record you want, and we'll send you a Productimeter to fit requirements. Use it 30 days. If not satisfied, return it in good order and we will cancel the charge.

(1353)



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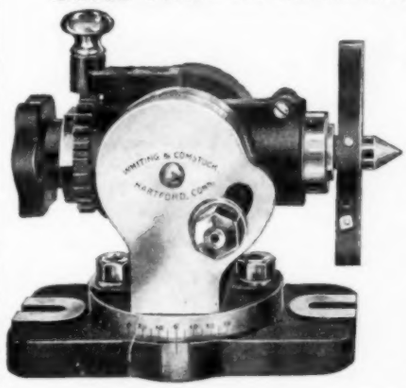
Saves Time on Small Milling Jobs



by using a plain milling machine, equipped with our

Semi-Universal Dividing Head

a simple, absolutely accurate piece of equipment which is needed in every shop.

Write for details.

Whiting & Comstock
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10-in. Compound Circular Table
A UNIVERSAL PROTRACTOR

With this device you can work from any number of centers at one setting of the work, such as required on Dies, Jigs, Templates, Cams, Etc.

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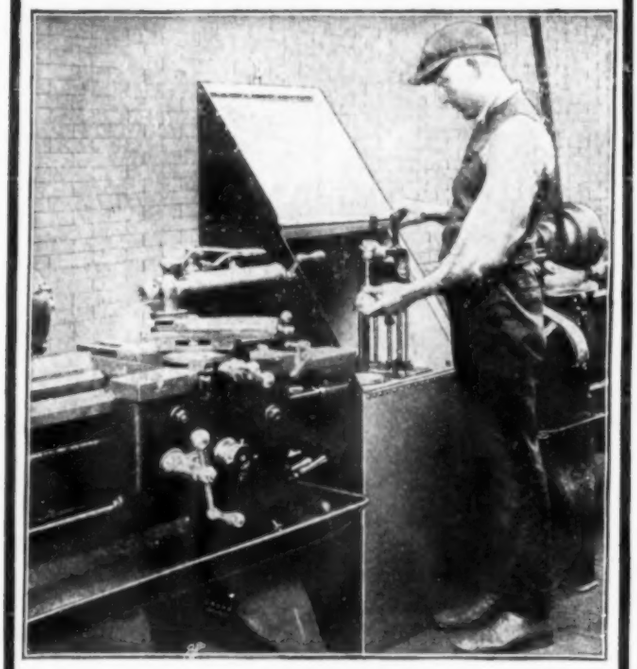
Prevent Idle Time
of Men and Machines



By placing Bowser Lubricating Oil Cabinets in departments where oil is used.

There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

Save the Oil

The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

Write for literature, explaining why and how Bowser Systems pay for themselves, many times over in saving of oils and labor.

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Write in for a free sample quantity of Minolard, the universal Cutting Oil. A trial will prove its value. Just send us a postal today for the *free trial quantity.*

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Give perfect satisfaction where others fail. State style and size in which you are interested, and we will send free samples and catalog.

Gits Bros. Mfg. Co.
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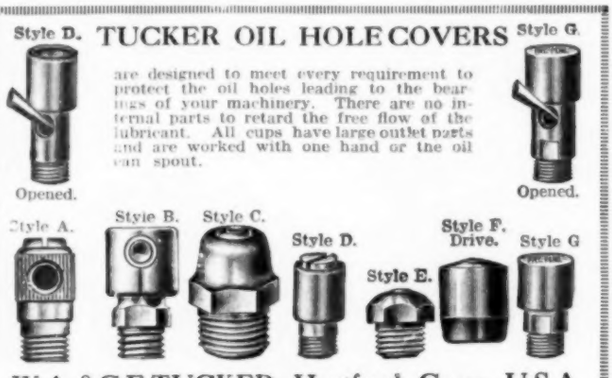
TUCKER OIL HOLE COVERS



are designed to meet every requirement to protect the oil holes leading to the bearings of your machinery. There are no internal parts to retard the free flow of the lubricant. All cups have large outlet ports and are worked with one hand or the oil can spout.

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FOREIGN AGENTS: Fenwick Freres & Co. Paris, France. C. W. Burton, Griffiths & Co., Ltd., London, Eng.

Buy Less Oil and Get Better Lubrication

KEYSTONE OF GEM GUARANTEE GOOD QUALITY TRADE MARK

This may sound strange but faulty oil cans are a big factor in oil bills.

THE GEM OILER is made scientifically correct which means that you use all the oil you buy, for Gem Oilers can't leak or fill with dust and their spout can't clog.

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Japans

A Lesson in Surface Protection

A short time ago these agricultural implements were new and had a beautiful, glistening finish. Moisture attacked the surface, rust set in the metal, decay started in the wood—and soon they were useless. The finish was nothing but a cheap paint, a temporary beautifier, but a poor surface protector.

A moisture proof, wear resisting finish is the best protection against weather conditions to which farm machinery and implements are subjected. Users of equipment which is exposed to the weather will appreciate thorough surface protection.

Hilo Varnishes, Enamels and Japans are moisture proof and wear resistant. They are protecting many wood and metal products.

The Hilo Service Salesman knows the *why* and the *how* of finishing. He is prepared to help you select finishes that will best protect your products. Send for him.

Hilo Varnish Corporation
Formerly Moller & Schumann Co.
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YOUR bearings will never become ruined by grit or dust entering the oil holes if you use the

Bennett's Self-Closing Oil Hole Cover

It is economical in cost and convenient in use. Merely drill a hole in bearing and press cover in position. No projections to interfere with proper cleaning. Our full line is illustrated and described in Catalog M. Send in your name for a copy.

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Protect Your Bearings with

The Patented "Conus" spring cover, a feature found only in "Conus" Oil Cups

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Made of high-grade Swedish Steel heavily nickeled. Installed without tapping.

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Simple—efficient—economical

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Put your Cleaning Problems up to us.

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No. 51

FOR DEPENDABILITY SERVICE, AND ECONOMY

EMPRESS GREASE and OIL CUPS

Should be standard lubricator equipment on your Machine Tools

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Empress

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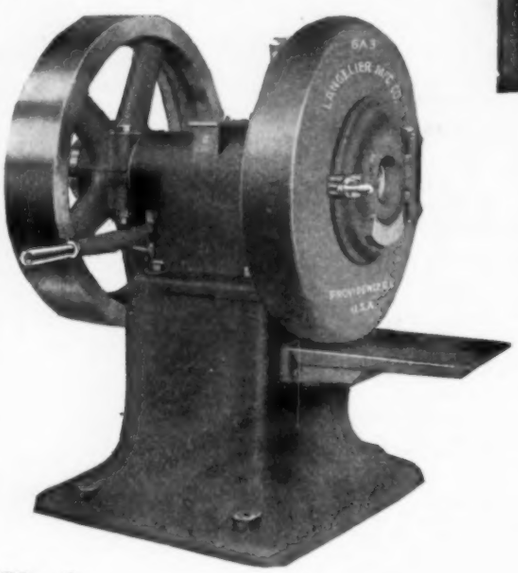
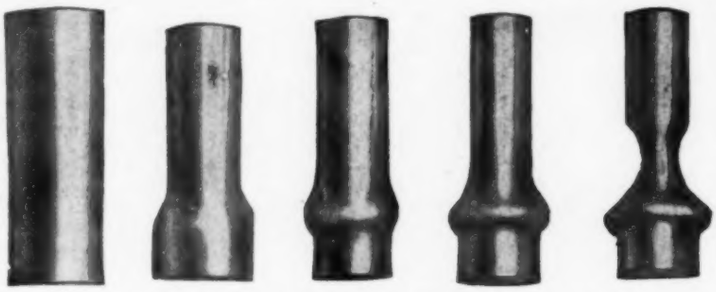
It shows the EMPRESS line—complete

Rotary Swaging

Will accurately form metal with economy





The Langelier Reducing or Swaging Machine forms different metals without wasting any of the material. It improves the stock by compression, besides preserving same metal on the surface—the best metal, which with any other machine is cut away. In addition to this big economical feature, it is more accurate and more rapid.

In working extremely hard metal, we arrange **these machines** to **swage the metal hot,** doing much of the work formerly done by trip hammers at a very much higher rate of production, with unskilled labor, at lower cost and with greater accuracy.

3000 Blows a Minute Must Mean Rapid Work

Revolving dies are within the round casing in front. These dies are forced on the work by a succession of sharp blows from the hammer blocks behind the dies. These striking at the rate of about 3000 blows a minute reduce the material, such as drill rod, tubing, copper, etc., with great rapidity. The machine is perfected to give absolutely uniform and well finished work.

A Special Machine for Your Special Work

We build these machines in eight different sizes to take solid stock from pin wire up to 2 inches dia. and tubing up to 4 inches dia. We will study your work and build machines especially for it, to be operated by unskilled labor, producing the blow best adapted to secure the desired results, according to the nature of the material to be worked, its size and amount of reduction, and whether solid or hollow, **hot** or **cold.**

Write and tell us about the work you want done—sending samples or blueprints.

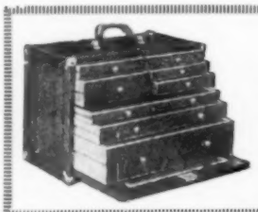
LMCo. **Langelier Manufacturing Co., Arlington, Cranston, R. I., U. S. A.**

Watch for this mark

Fairbanks-Morse Co.

MACHINE TOOL DEPARTMENT

30 Church Street — New York City



START TO ECONOMIZE

It costs considerable to replace lost and ruined tools. Get a "Gerstner" Case and you'll be money in at the end of the year. Select one from our free catalog showing many styles of guaranteed Tool Cases. **Write for Catalog.**

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New oil from old oil——
New waste from waste waste

no more than a trace of oil remains in oily-chips after passing through this machine. Same is true of waste. The reclamation in both cases is the limit of mechanical possibilities. Centrifugal; direct steam turbine drive. Quadruple capacity of belt driven machines. Quicker, better; more easily charged and discharged; less driving power; longer life. Every possible feature for ease in handling. *Write for full data.*

Cavoil Separators

Oil & Waste Saving Mach. Co., Real Estate Trust Bldg., Phila., Pa.

TRAHERN PUMPS

Dependable Under All Conditions

They are built for hard, continuous service. Constructed to operate at low speed—thus giving long life. Will shoot 16½ gallons of coolant per minute with sufficient force to reach the deepest cuts and bores. Prices low. Shipments from stock.

TRAHERN PUMP DIVISION

Geo. D. Roper Corp.

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WATCH FOR OUR NEXT AD. ON THE PRESTOMETER FLUID GAUGE

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VOLYUM PUMPS

have this advantage—the flow of coolant can be cut down or shut off entirely, without damage to the pump or pipe and without the aid of a relief valve. Many other points of advantage are detailed in our booklet "Full Facts."

The Volyum Pump Co.

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"Rollway" Pumps for Machine Tools

The following advantages make the "Rollway" particularly adapted to machine tools:

Valveless, self-priming, non-clogging, low speeds and large volume. Our catalog gives many interesting facts. Write for your copy today.

Michigan Machine Co., Detroit, Mich.

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THE KELLY REAMER CO. ADJUSTABLE FLOATING REAMERS CLEVELAND, OHIO, U.S.A.

ON MOTOR PARTS

Read the letter; it tells about a crank case with 11 holes made all at one time—49,500 holes without a rejection!

HINKLEY MOTORS CORPORATION
MAKERS OF
HEAVY DUTY AUTOMOTIVE ENGINES

DETROIT, MICH. U.S.A. March 20, 1919.

The Kelly Reamer Company.
Cleveland, Ohio.

Gentlemen:

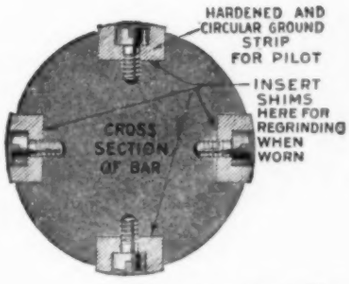
In finishing up our contract with the Government for motors for Class "B" Military trucks, we feel that a special word of commendation is due you as one of the important factors in the successful completion of our work.

We have built 4500 motors, each crank case carrying a train of five gears, and out of this production, we have not had a single rejection because of noisy gears. We feel that this record was made possible largely through the use of Kelly reamers, and we wish to express our very sincere and grateful appreciation of the service rendered us by your Company.

Yours very truly,

HINKLEY MOTORS CORPORATION,

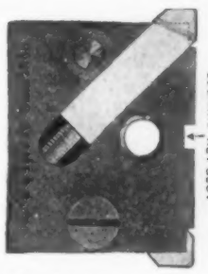
C. Snyder
Factory Manager.



KELLY LINE BARS have multiple cutters and several bars in one fixture, all rotating and feeding at the same time — increase the output per machine unit.

In KELLY LINE BARS the reamers fit the slots in the bar and can be removed and replaced without disturbing their adjustment.

The "locating key" centralizes the reamer and our special grinding and relieving arbor permits **exchange reamers** to be ground without stopping the production work.



Our district offices listed below have interesting catalogs and photo album showing Kelley Tools in action.

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E. A. Harper Tool & Supply Co.
30 Church St., New York
Phone Cortlandt 1615

Philadelphia and Baltimore
E. A. Harper Tool & Supply Co.
Bourse Building, Philadelphia
Phone Lombard 490

Syracuse, N. Y.
Roberts Tool & Supply
118 Warren St.
Phone James 115

Cleveland
A. H. Howard Sales Engr. Co.
410 Wade Bldg.
Phone (or call) Main 6972

Cincinnati and Dayton, O.
John M. Howett Co.
12 W. 2nd St., Dayton
Phone Ludlow 419

Indianapolis, Ind.
Thomson Tool & Supply Co.
Odd Fellows' Building
Phone Main 4378

Detroit
National Sales Engr. Corp.
Kresge Building
Phone Cherry 4037

Chicago
R. E. Ellis Engr. Co.
621 Washington Blvd.
Phone Haymarket 2407

Milwaukee, Wis.
James Gibbons
524 Wells Building
Phone Broadway 866

San Francisco
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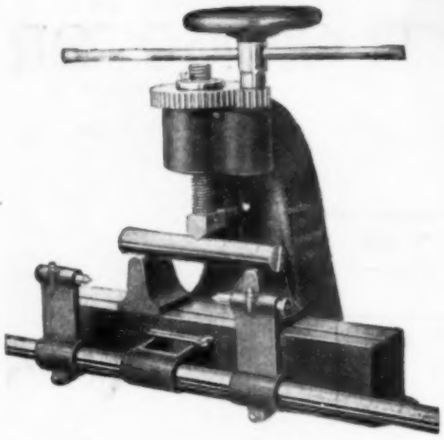
173 First St.
Phone Sutter 1086

THE KELLY REAMER CO. CLEVELAND, O., U. S. A.

1545 COLUMBUS ROAD

Geier Straightening Presses



Scientific management is based principally on the use of labor-saving equipment for reducing production costs. Geier Straightening Presses will quickly pay for themselves in any shop by reducing labor and saving good material from the scrap pile.

Catalog on Request.

THE P. A. GEIER COMPANY
540 East 105th St., Cleveland, Ohio

Your Odd Forging Jobs

can be handled economically on a

Bradley Compact Hammer

They represent 45 years experience in building forging hammers for every requirement. They are compact, powerful and exceptionally fast. Their blows can be regulated at the will of the operator.

Let our experts advise you on your forging problems and how Bradley Hammers can handle them for you with a saving. Write.

C. C. BRADLEY & SON, Inc.
Syracuse, N. Y.

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Little Giant Power Hammers

25, 50, 100, 250 and 500 lb. models

BELT OR MOTOR DRIVEN

Motor Driven **Belt Driven**

Guaranteed FOREVER against defective material and workmanship, and sold on 30 days' trial.

Durability and absence of harmful vibration combined with machine gun rapidity and precision.

Special dies for any forging purpose. Prices quoted on receipt of drawings or preferably a finished specimen of work to be done.

Operator carefully protected against personal injury.

More than 10,000 Little Giant Power Hammers are in daily use.

Annual repair sales for all Little Giant Power Hammers in use from the first one made 27 years ago to the latest, all sizes and models, average 48 cents each, or less than 2/5 of 1% of original cost to purchaser.

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LITTLE GIANT COMPANY
Established 1876
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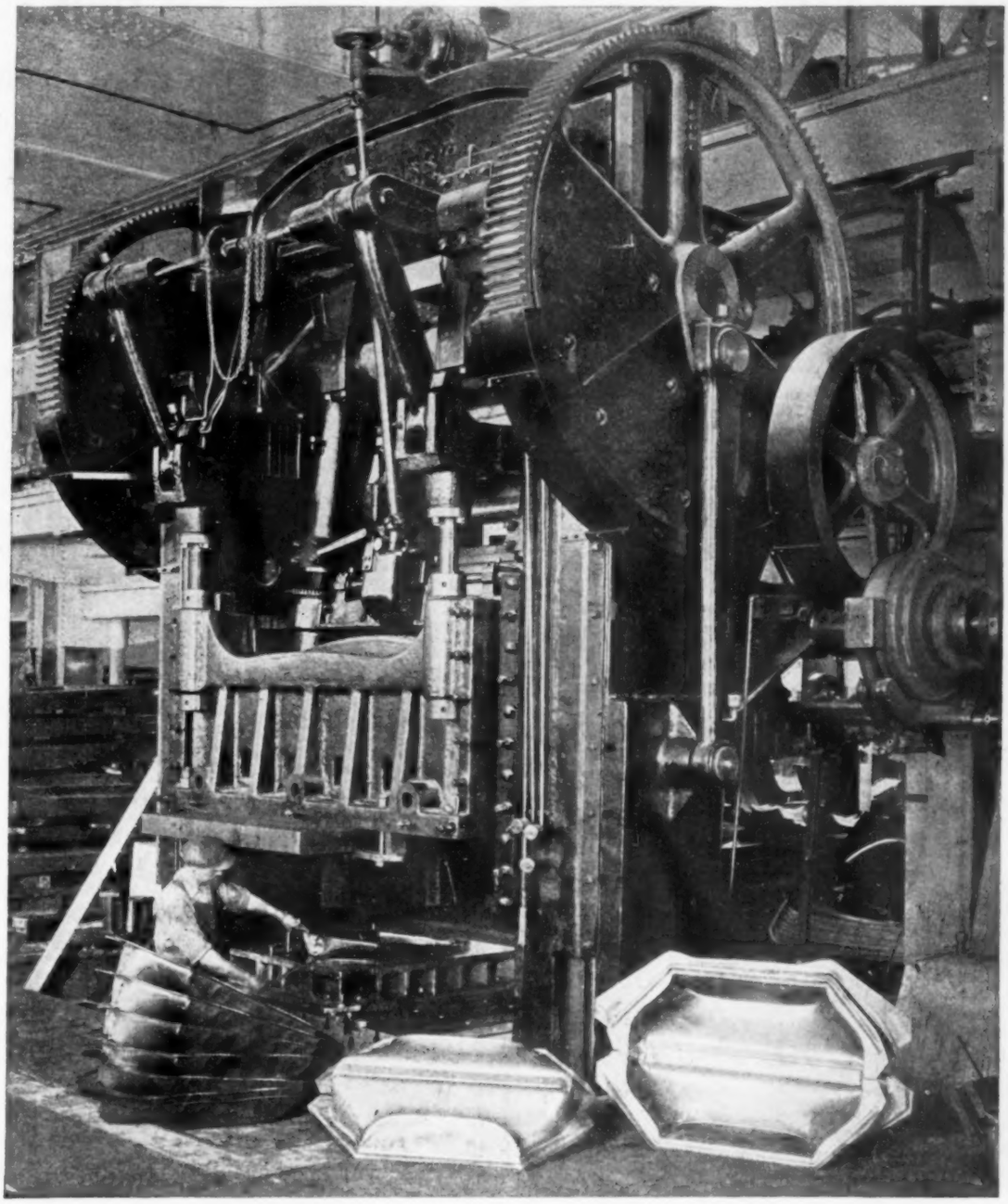
The "Toledo" Inclinable Presses

Endurance and Performance—with accuracy and economy—the paramount consideration in the design and construction of these presses which have stood the most rigid tests during the 35 years of their prestige. Over 20 sizes for all classes of blank cutting, forming, perforating, drawing, shaping and combination die work.

The Toledo Machine & Tool Co.
Toledo, Ohio

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.
Paris, Turin, Zurich and Barcelona.



Duplicating the Unsymmetrical

The C. R. Wilson Body Corporation, of Detroit, draws two cowls, back to back, from one blank. It thus secures a symmetrical draw in the case of an unsymmetrical part. The press is a "BLISS" No. 409-D Double Action Toggle of the Double Crank Type.

BLISS 1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y. *and* HASTINGS, MICH.

BLISS 1920

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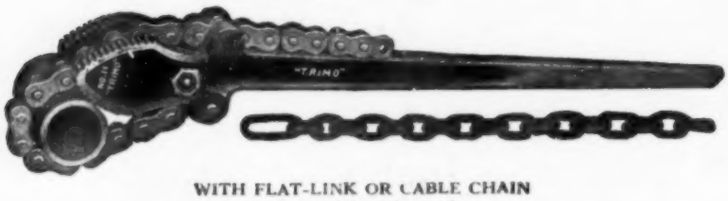
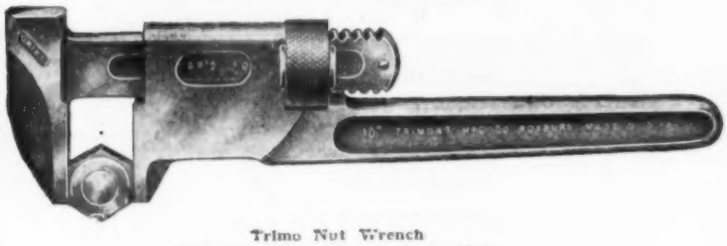
No. 89

The Trimo Pipe Wrench
Made with Wood Handles in 6-in., 8-in. 10-in. and 14-in. Sizes; with Steel Handles in All Sizes.



WITH FLAT-LINK OR CABLE CHAIN
Trimo Chain Wrench



Trimo Nut Wrench
4-in., 8-in., 10-in., 12-in., 15-in., 18-in. and 21-in. Sizes.

Especially Suitable for Railroads

TRIMO

The Word Trimo

stands for good tools made by the Trimont Mfg. Co., which are the following:

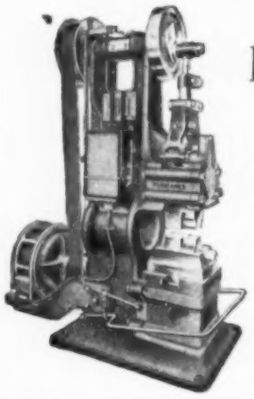
The Trimo Pipe Wrench
The Trimo Chain Pipe Wrench
The Trimo Monkey Wrench
The Trimo Pipe Cutter (Hand)
Sold at Same Price as Others

The Four Good Points

that make the ***Trimo Pipe Wrenches*** superior are the ***Spiral Spring*** always in place—***Steel Frames*** that will not break—***Nut Guards*** that protect adjustment nut—and the ***Inserted Jaw in handle*** that can be replaced when worn. ***Save money*** and buy Trimo goods, made by

TRIMONT MFG. COMPANY, 55-71 AMORY STREET, ROXBURY, MASS., U. S A.

Send for Catalog No. 75, describing our Complete line.



Fairbanks Dupont Hammers

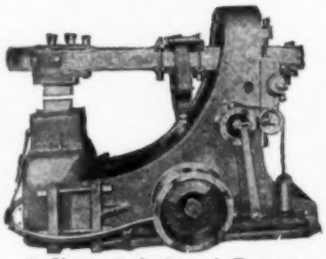
—Belt or— Motor-Driven

These hammers embody a design and workmanship that is unsurpassed.

Catalog?

United Hammer Co.
Oliver Bldg., Boston, Mass.

What Will You Do About It?



6 Sizes—2 Styles of Frames

We assure you that you take no chances when you install a Rochester Helve Hammer. On the contrary you are putting yourself squarely on the road to complete satisfaction.

Get our Helve Hammer Book

The West Tire Setter Company
Rochester, N. Y.

PRESSES and SHEARS

Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.
Military Road and Lansing St., Buffalo, N. Y.

Arguto

Oilless Bearings

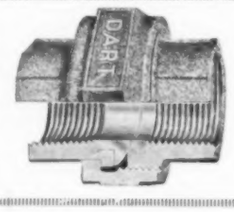
for loose pulleys, friction clutches, high speed machinery. Eliminates lubrication—runs from 8 to 15 years without oiling.

ARGUTO OILLESS BEARING CO.
147 Berkeley Street, Wayne Junction, Philadelphia

ATLAS Presses

There is nothing to offset the saving when you invest in an Atlas Press. You get two presses for the cost of one when you install Atlas Presses. **Write for the Atlas Bulletins.**

Atlas Press Co., 317 N. Park St., Kalamazoo, Mich., U. S. A.



Absolutely Tight

non-corrosive bronze seats accurately ground together make **Dart Unions** non-leaking. A free sample on request. **Write for catalog and price list No. 20.**

E. M. Dart Mfg. Co. Providence R. I.

The Fairbanks Co., Sales Agents Canadian Factory, Dart Union Co., Ltd., Toronto.

Ask your dealer for prices

The Nazel Air Hammer

Noted for its blow and control

"A self-contained unit, HAMMER AND COMPRESSOR COMBINED, built in three types, six sizes arranged for BELT OR DIRECT MOTOR DRIVE, with capacities up to 7 inches square, for all manner of jobbing, manufacturing and certain classes of drop forgings."

Nazel Engineering & Machine Works
4039 N. Fifth Street, Philadelphia, Pa.

Easier on Your Dies Better Press Work

Dies last much longer if your press keeps perfect alignment. The long slide, a patented feature of

The V & O Long Slide Inclinable Press

guarantees against shifting under heavy strain—your work is kept uniform, costs kept lower. Weight for weight, V & O Presses stand more abuse than others, because of their balanced construction to meet heavy strain.

Write for Catalog

The V & O Press Co.
Glendale, Brooklyn, N. Y.

ELMES Chicago Hydraulics

HYDRAULIC MACHINERY FOR ANY PURPOSE

Accumulators	Press s, Flanging
Bars, Boring	Presses, Forcing
Benders, Rail	Presses, Forging
Fittings, High-pressure	Presses, Forming
Jacks, Hydraulic	Presses, Hand Screw
Lifts, Hydraulic	Presses, Insulation
Machinery, Special	Presses, Laboratory
Oil, Hydraulic	Presses, Metal-Drawing
Packings, Hydraulic	Presses, Nosing
Patterns, Wood	Presses, Portable
Presses, Arbor	Presses, Pulling
Presses, Automobile Body	Presses, Straightening
Presses, Banding	Presses, Tile
Presses, Broaching	Presses, Wheel
Presses, Crankpin	Pumps, Hydraulic
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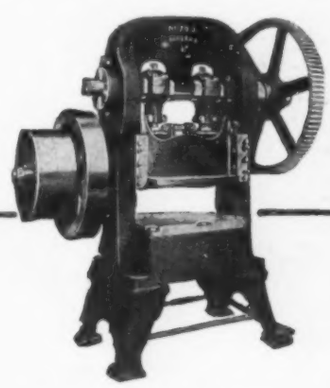
Charles F. Elmes Engineering Works
Established 1861
1001-1003 Fulton Street, Chicago, U. S. A.

NIAGARA



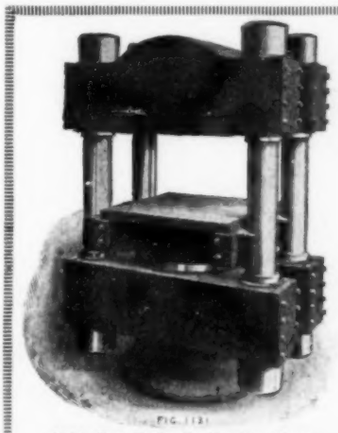
Double Crank Press

Built to facilitate handling of the heavy work. This machine will increase your production and at the same time reduce costs.

Let us tell you more about Niagara Presses.

Niagara Machine and Tool Works
Buffalo, N. Y., U. S. A.

Mfrs. of Machinery for Sheet Metals



1500 Ton Hydraulic Forming Press

HYDRAULIC MACHINERY

Submit your hydraulic high pressure problems to our skilled hydraulic engineers. Your every requirement can be met satisfactorily and economically.

Submit your inquiries.

The Hydraulic Press Mfg. Co.
Engineer-Builders of Hydraulic Machinery exclusively
Mount Gilead, Ohio
New York City
Detroit Buffalo
Suffern, N. Y.
Cleveland
San Francisco

National
Quality
We believe that quality comes only as the reward of energetic, sincere striving to excel. This is the secret of the exceptional quality found in National Twist Drills, Reamers and Cutters.
National Twist Drill & Tool Co.
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Offices:
30 Church St., New York City
565 Washington Blvd., Chicago
520 Arch St., Philadelphia
76 Pearl Street, Buffalo
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NATIONAL
TWIST DRILL & TOOL CO. DETROIT, U.S.A.

Do You Know How Much It Costs You To Use Your Diamond Tools?

Disbursed	Returned	No. Dressings	Weight	Loss	Price per 1/10 Carat	Cost per Dressing

Purchased from WHEEL TRUEING TOOL CO.
Detroit - Milwaukee - Windsor - St. Catharines

Average cost per dressing .....

General average cost per dressing .....

WHEEL TRUEING TOOL CO. *Tool No.* .....

DIAMOND RECORD CARD *Date disbursed* .....

Dept. No. ..... *Date returned* .....

Operator's No. ..... *Name* .....

Wheel size ..... X ..... *Kind* .....

Grain ..... *Grade* .....

Check one number for each dressing. **TAKE LIGHT CUTS.**

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
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29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

THE basis of your purchase of Diamond Tools should be in the actual cost of each operation performed with that tool until it is unfit for further use.

The Wheel Trueing Tool Company, through years of careful preparation of accurate statistics concerning the cost of cutting with Diamonds, has placed itself in a position where it can recommend to you the exact size and kind of Diamond for every purpose and furnish you with cost figures that will guarantee the minimum expenditure per dressing.

The initial cost of a Diamond tool should not influence you. It is possible that you may pay twice as much for a diamond and yet, because of its fitness for a particular job, save much more than the extra initial cost by lower cost per dressing.

Bear this in mind when buying Commercial Diamonds. The Wheel Trueing Tool Company is the only house rendering service in cost per operation. Note the "Office Record Card," a protection against thievery, and the "Operator's Card," for recording the work of each tool, both furnished at no cost to our customers, which permit you to keep an accurate account of your tools and your costs and permit us to give you bonified service in repairs and re-settings.

Write us for particulars of this valuable service. We will gladly send a representative to explain our way of doing business.

-BORTZ-
DIAMONDS
-CARBON-

WHEEL TRUEING TOOL CO.
IMPORTERS
OF
BORTZ & CARBON DIAMONDS
MANUFACTURERS OF
DIAMOND TOOLS FOR EVERY MECHANICAL PURPOSE
2129 PENOBSCOT BUILDING
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Cable Address
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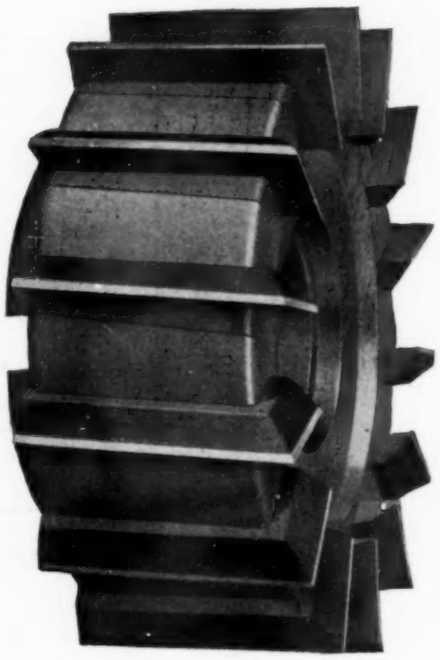
Blades Cost Less Than Cutters

High-speed steel in the bodies and frames of your cutters is expensive. There is no need for having high-speed steel anywhere but in the blades. They do the cutting, and—



Moback Cutters
Get Double Life From Blades

When the blades have been worn out you buy new blades and *not* a new cutter.

Original cutting blades can be adjusted so that when they have worn all the way down, they can be brought to a second position and the cutter is again as good as new. This is double life from the blades right at the start.

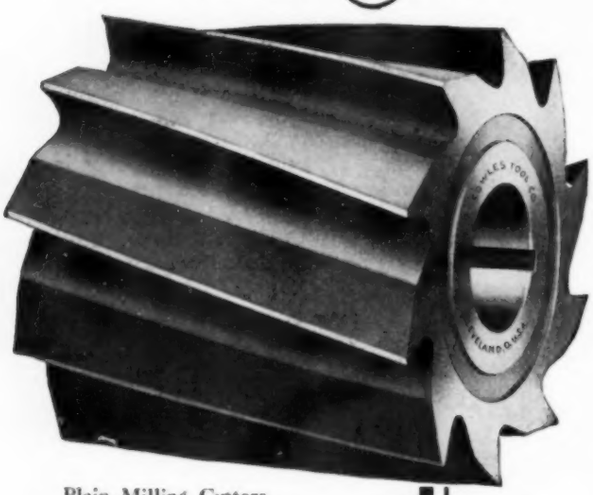
The jaws are clamped in with wedges and are as firm as if solid. Blades are of high-speed steel and frames of machine steel.

Moback Cutters give 100% cutting efficiency.

Write today for circular and prices

Moback Tool & Machine Mfg. Co.
330 Atlantic Ave., Boston, Mass.

Quality First



Plain Milling Cutters
Side Milling Cutters
Interlocking Side Milling Cutters
End Mills
Angular Cutters
Convex Cutters
Concave Cutters
Shell End Mills
Metal Slitting Saws, etc.
Inserted Blade Cutters
Special Cutters

COWLES CUTTERS
for
DEPENDABILITY

AFTER ALL, the only thing that counts is results, and you get GOOD results when you use "COWLES CUTTERS."

Our CUTTERS are our SALESMEN. Regular styles and sizes carried in stock; prompt deliveries on others.

We SPECIALIZE in the manufacture of HIGH-SPEED STEEL Milling Cutters, and that's one reason they're TOUGH and DURABLE.

Wire or write for prices

COWLES TOOL COMPANY
Cleveland, Ohio, U. S. A.

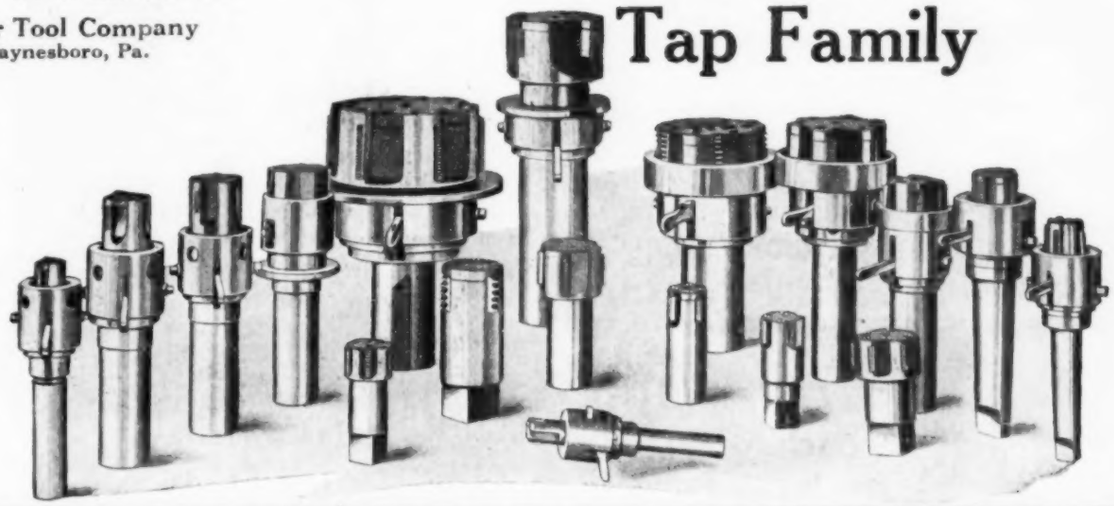
This line is busy—

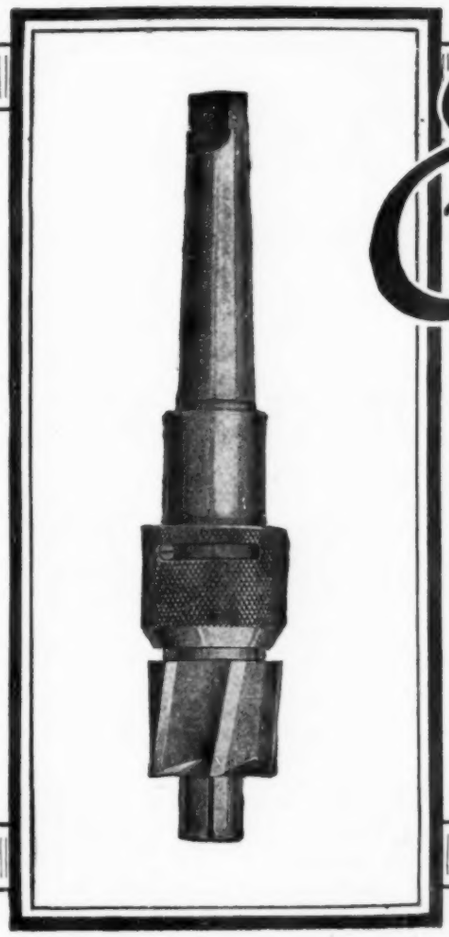
There are very good reasons why the Victor line is busy. Ask the man in the overalls—the man who has used a Victor tap. Then ask the man in the office—the general efficiency man who watches the production and cost curves. Then perhaps you will want to make our line still busier.

Victor Solid Adjustable and Hand Collapsible Taps are the kind of tools you save. The chasers are all that wear out.

Victor Tool Company
Waynesboro, Pa.

VICTOR
A Mighty Industrious Tap Family





Easy-Lock
Holders & Cutters

The holders allow quick changes
The Cutters cut cutter costs.

With Easy-Lock Holders your operators can save time in changing cutters for counterboring various size holes. A twist of the wrist locks the cutter in place or releases it.

The wear of the cutter can be taken up until three-fourths of it is used up.

There is economy in Easy-Lock Holders and Cutters that you should be enjoying.

Write today for our circular which describes them in detail

Manufacturers Machine Products Co.
370 Mt. Elliot Ave.
Detroit, Mich.

COST-CUT
COUNTERBORES

Here's one of the biggest counterbore propositions ever offered:

We will send you, *free of charge*, any size of Cost-Cut Counterbore that you wish.

Try it out in your shop. Put it through the hardest jobs you have—give it all the punishment you want.

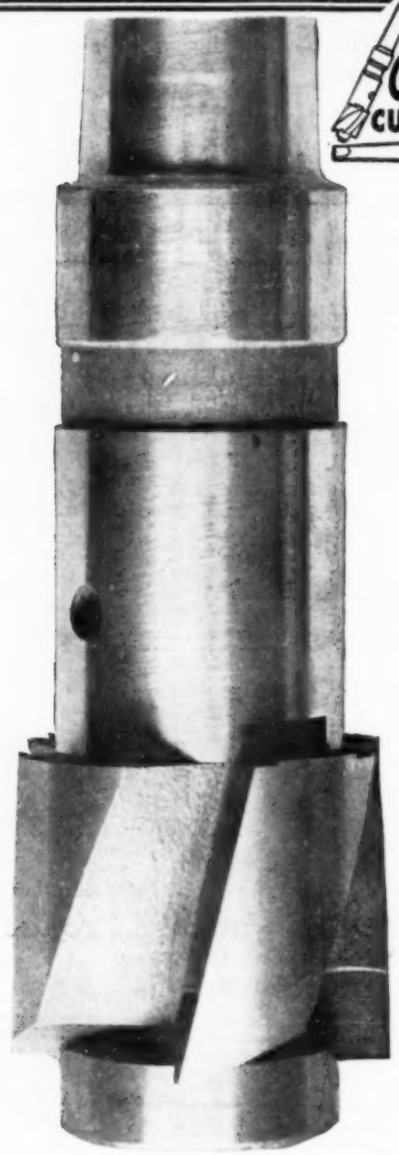
Then if the Cost-Cutter fails to *increase your production* from 15 to 50 per cent, or if it proves in any way unsatisfactory, send it back.

This trial will cost you absolutely nothing. Write to us NOW

COST-CUT COUNTERBORE CO.

"The Counterbore People"

74-76 Fort St., East, Detroit, Mich.



Williams' Superior Drop-Forged Wrenches

Big Ones
Little Ones
Bent Ones
Straight Ones
Thick Ones
Thin Ones

40 Standard Patterns in about 1000 sizes with openings from 3/16 to 7⅝ inches.

Ask for Booklet.

J. H. WILLIAMS & CO.

"The Wrench People"

35 South Clinton St., Chicago, Ill.
35 Vulcan St., Buffalo, N. Y.
35 Richards St., Brooklyn, N. Y.

True Economy—

In these days of increasing overhead costs, speed in production has become a highly important factor, and investment in any equipment which will accelerate output is true economy. Vixen Files cut three to five times faster than ordinary types. For this reason alone, although their initial cost is higher, they are the most economical.

Then, too, Vixen Files can be resharpened at least six times, thus extending their period of usefulness far beyond the average—another point for consideration.

We will gladly send you full particulars

VIXEN TOOL CO.

Newark, New Jersey

VIXEN FILES

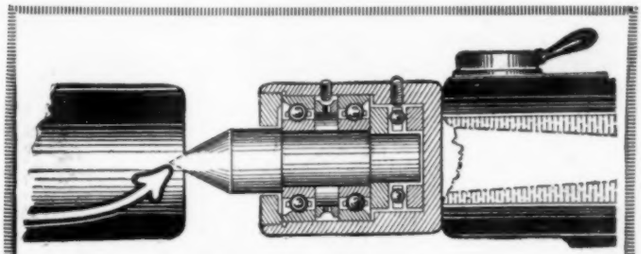
ADVANCE

Tools That Hold Their Edge

Advance Cutters hold their edge because they are manufactured from the proper materials to stand the strain of cutting — and are made by men skilled in the art of tool making.

Request our stock list. Immediate deliveries.

The Advance Tool Company
Canal and Jackson Sts., Cincinnati, Ohio



K. & H.
LATHE CENTER
THE "*LIVE*" CENTER THAT REVOLVES

Turns with the work. Radial and thrust load carried on "NORMA" Precision Bearings. Indorsed by foremost mechanical engineers. Eliminates friction and burnt-out centers. No chattering—no enlarged center holes—permits work of greatest precision at highest speed. Made in standard and special sizes. *Write for circular and prices.*

Kell, Hock Sales Co.
Dept. B, 354 Mulberry St., Newark, N. J.

Bilton Cutters

We take especial pride in the product of our cutter department. The finest most up-to-date machinery, operated by men long trained to recognize only Bilton quality are the reasons for that pride. We have made the trade of cutter making almost a profession by close attention to every mechanical detail and time tested experimenting.

Our present line includes plain milling cutters, side milling cutters, form milling cutters and any tool of like nature.

We can make the cutter that will simplify that troublesome job of yours. Ask for particulars.

Bilton Machine Tool Co.
Housatonic Ave., Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co., Ltd.

The Nicholson Arbor Press Speeds Up Production

It saves time, labor, and money. Your men will appreciate its convenience. Besides pressing out arbors, it is useful for punching, bending, broaching, and similar work. Capable of instantly exerting a pressure of three tons. It's a reliable companion of

Nicholson Expanding Mandrels

Get a set of these (nine to the set) in place of your ton or two of solid mandrels. These expanding mandrels fit any hole, round or square, from ½ in. to 7 in., without the need of calipering or turning down. You can figure the saving in time, labor, and storage space.

You can have either of the above specialties on 30 days' trial. If they're not satisfactory, send them back collect. Ask for free booklets on these and other Nicholson products.

W. H. Nicholson & Co.
114 Oregon St., Wilkes-Barre, Pa.

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Ludgate Square, London, E. C.

Burton Fils,
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Paris, France

Monti & Oscuro,
Milano, Italy

Andrews-George Co.,
16 Takegawa-cho, Kiobashi-Ku
Tokyo, Japan

Carbon and High Speed DRILLS

Prices Right — Reliance Supreme Quality

Try us on your Drill Orders

High Speed and Carbon
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Supreme Quality
Prices
Consistent

The best stock in America

High Speed & Carbon Drills
Reliance
Supreme Quality
Prices
Interesting

We can give you every size from 1/64 to 3 inches Immediately—No Waiting

Reliance Steel & Tool Company
24-26 Murray Street
New York

BILLINGS & SPENCER TOOLS SAY RELY ON ME

BUCKEYE

Look for the name on the shank

That's your guarantee of the best in twist drills, reamers and special tools.

Only superior grades of steel are used in their making; that's why they give the greatest satisfaction, and the last hole drilled or finished by a "Buckeye" tool is just as true to size as the first one.

Ask us to send our catalog and price list on "Buckeye" quality tools.

The Buckeye Twist Drill Co.
Alliance, Ohio

Chicago Office: 26 South Jefferson St. New York Office: 2 Rector St.

TWIST DRILLS

Grover
File Handles

Grover Handles are made of selected White Birch with substantial dressed steel ferrules held in place in the simplest possible manner and of sufficient length to prevent the splitting of the filler. After months of use the old filler when it becomes worn can be replaced by new ones.

Grover File Handles are being used by leading manufacturers and railroads throughout the world. They give true satisfaction.

Write for details.

Grover File Co.
Nashua, N. H.

USE SUPER-SIX EXPANSION REAMERS

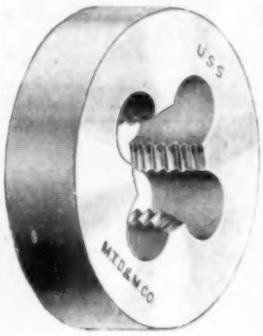
Just three parts to a Critchley Improved SUPER-SIX Expansion Reamer: Body, blades, and binding nuts.

Body of heat-treated alloy steel, with no hole through center to weaken it. Blades of high speed tool steel, accurately ground, and slightly staggered to prevent chattering. Binding nuts hardened and ground to conform with the tapered ends of blades, making for precision in even unskilled hands.

Drive, shrink or sliding fits—any size hole from $\frac{15}{32}$" to $4\frac{1}{16}$"—are made to micrometer limits of tolerance with a full set of SUPER-SIXES—the tool that has pulled many a mechanic out of a bad hole.

Cutter & Wood Supply Co
60 PEARL STREET
BOSTON 9, MASS.

better holes fewer dollars



"MORSE" ROUND DIES

Can be obtained in either solid or adjustable types, singly or in sets complete with holders and taps in V., U.S.S., or Whitworth shape of thread. They are Real Dies, cutting clean, accurate threads and holding their size.

MORSE Twist Drill & Machine Co. **New Bedford, Mass., U. S. A.**

Keystone

Expansion Reamers Specially Designed for Production Tools

Have you our Catalog?

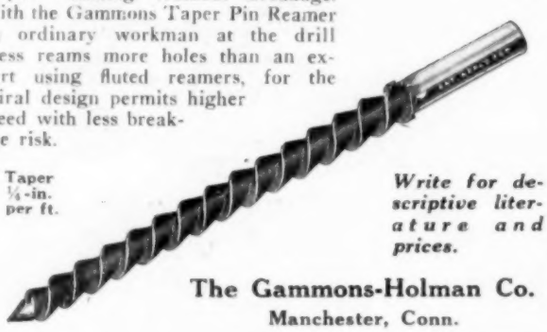
Keystone Reamer & Tool Co.
Millersburg, Pa.

180 No. Market St. CHICAGO
30 Warren St. NEW YORK

The Gammons Taper Pin Reamer

Taper Reaming Without Breakage. With the Gammons Taper Pin Reamer an ordinary workman at the drill press reams more holes than an expert using fluted reamers, for the spiral design permits higher speed with less breakage risk.

Taper ¼-in. per ft.



Write for descriptive literature and prices.

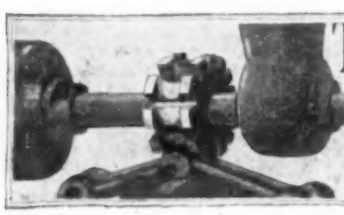
The Gammons-Holman Co.
Manchester, Conn.

WHY NOT?

install this die for accurate threads at a fast rate of production.

CHASERS can be furnished in time for your requirements.

THE IDEAL TOOL & MFG. CO.
BEAVER FALLS, PA.



THE STANDARD TOOL CO.

CLEVELAND OHIO

Only reliable products can be continuously advertised

DETROIT CENTERLESS CYLINDRICAL GRINDERS
MEAN CONTINUOUS GRINDING

INCREASED PRODUCTION is the keynote of every report that arrives from the users of Detroit Grinders. The fact that the work may be accomplished without centering is responsible for these increases. No accuracy is sacrificed in obtaining high speeds because the

Detroit Inspects as it Grinds.

We can prove the Detroit's superiority on your own work. Send us a score of samples and we will grind them free.

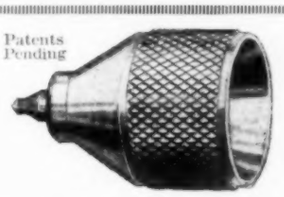
Detroit Machine Tool Co., Detroit, Mich.

"OK" BRAND **Drive Pin Punches**

A variety of sizes and lengths for driving out pins, rivets and bolts. Made of high-grade steel. Ask to see assortment of sizes at your tool dealers.

West Haven Manufacturing Co. - New Haven, Conn.

Patents Pending



COMBINED DRILL AND COUNTERSINK TOOL

For quick centering without removing tail stock center.

Made in four sizes.

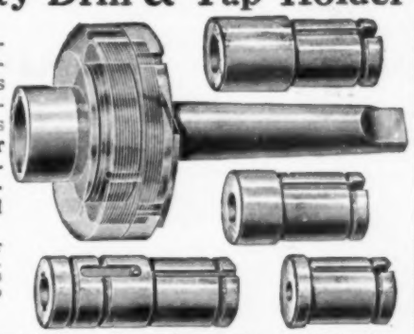
No. 1. No. 52 Drill.
No. 2. No. 46 Drill.
No. 3. No. 30 Drill.
No. 4. No. 13 Drill.

Lindquist Engineering Wks. Portland, Conn.

The Safety Drill & Tap Holder

is the only attachment for the purpose that gives universal satisfaction and is Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.

Nothing to *break* or get out of *order*. Made in 4 sizes covering from 0 to 2½ in. diameter.



The Beaman & Smith Co., Providence, R. I., U. S. A.

Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed

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Why Expert Mechanics Root for AMERICAN SWISS FILES

First, they find that they **"take hold"** better and cut more accurately, because the teeth have the proper cutting angle and clearance, and are spaced uniformly **ALL over the surface.**

Second, they find American Swiss Files hold their edge **longer**, because of our especial heat treating methods.

Don't miss any of our "Big League Series" of ads. See the ad. last week? Watch next week

American Swiss File & Tool Co.

E. P. Reichhelm & Co., *Selling Agents*

24-26 John Street, New York

TRADE MARK
DELTA

DELTA FILES

HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE

DELTA FILE WORKS, Philadelphia

Chicago Offices 62 E. Lake St. New York Representatives. Dilworth Lockwood & Co., 260 West St.

FILES OF QUALITY

LOVEJOY
Inserted Cutter Tools

These tools have all the rigidity of a one-piece tool. The cutter cannot slip because it is held fast by a serrated pin lock.

Lovejoy Tool Company, Inc.
Springfield, Vermont

Rich

HIGH SPEED
Drills and Reamers
RICH TOOL CO.
504 Railway Exchange
CHICAGO

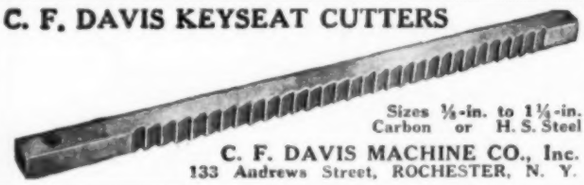
The PORTER BORING BAR
Real Rigidity

Correct clearance—form always maintained

Get new booklet.

SKELTON
TOOL CO., SYRACUSE, N.Y.

C. F. DAVIS KEYSEAT CUTTERS



Sizes ⅛-in. to 1⅛-in.
Carbon or H. S. Steel

C. F. DAVIS MACHINE CO., Inc.
133 Andrews Street, ROCHESTER, N. Y.

TAPS

⅛ to 5 inches

Prompt quotations made on your specification — prompt deliveries on your order. Latest equipment throughout plant.

THE GARDNER-BRYAN CO., CLEVELAND

ALBRO-CLEM HINDLEY GEARING
WILL DO THE WORK
When Common Worm Gearing Fails
ALBRO-CLEM ELEVATOR CO.
503 Erie Ave., East, Philadelphia, Pa.

LAVOIE AIR CHUCK

provide the most efficient means of chucking with the Lavoie Air Chuck. Of faultless design, these chucks hold under extreme cuts, and they will give the best service. Made in seven types with six styles of jaws.

Write for particulars.

The FRONTIER CHUCK & TOOL CO.
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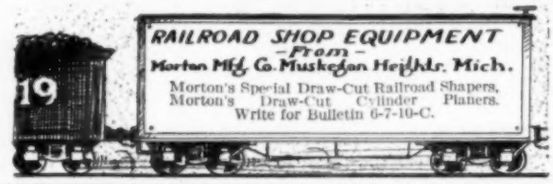


Cut Gears of Every Description

Spur Gears to 90 in. Diameter
Bevel Gears to 60 in. Diameter

We Design and Build Special Machinery

The Akron Gear & Engineering Co.
50-60 E. South St., Akron, O.

ULTIMATELY A BURY "UNIVERSAL" 3-CYLINDER AIR COMPRESSOR. WHY NOT INSTALL ONE NOW?

Durable as the Pyramids
All Sizes
All Types
All Pressures
For All Requirements

Silent as the Sphinx

Bury Compressor Co., 1800-1900 Cascade St., Erie, Pa., U.S.A.

It's Substantially Built—
This Sand Blast Machine

The Paxson-Warren Sand Blast Machine is the most efficient made. Every part is accessible. Repairs are few and all wearable pieces easily replaced. Better cleaning—cheaper cleaning of castings. Circular on request.

J. W. Paxson Company, 1021 N. Delaware Ave., Phila., Pa.
Manufacturers' Foundry Equipment and Supplies

"To thread or hob is an L-B job"

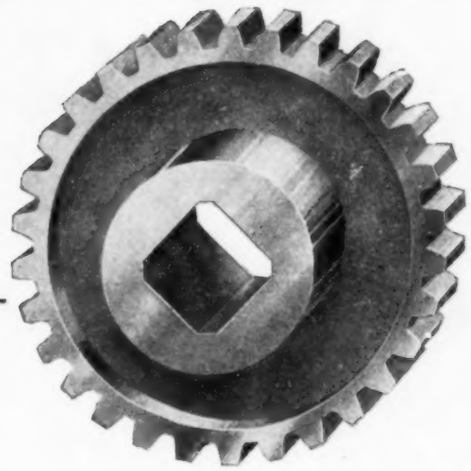
THE LEES-BRADNER CO., CLEVELAND, OHIO
Thread Millers Gear Generators

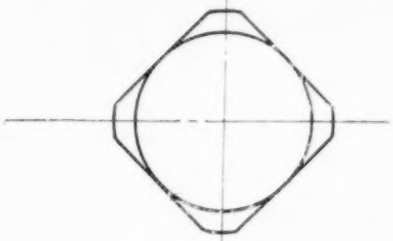
FERRACUTE PRESSES

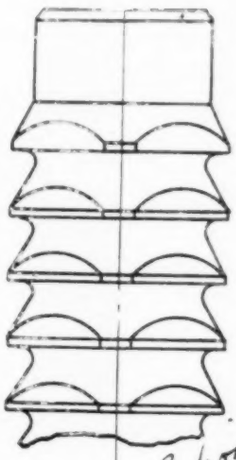
HUNDREDS OF SIZES AND STYLES

FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.

FERRACUTE MACHINE CO., BRIDGETON, N. JERSEY, U.S.A.







J. N. Lapointe Co.

"As versatile as ticket punches"

Broaching machines are by no means single-purpose tools. They are capable of performing a practically unlimited number of machining operations.

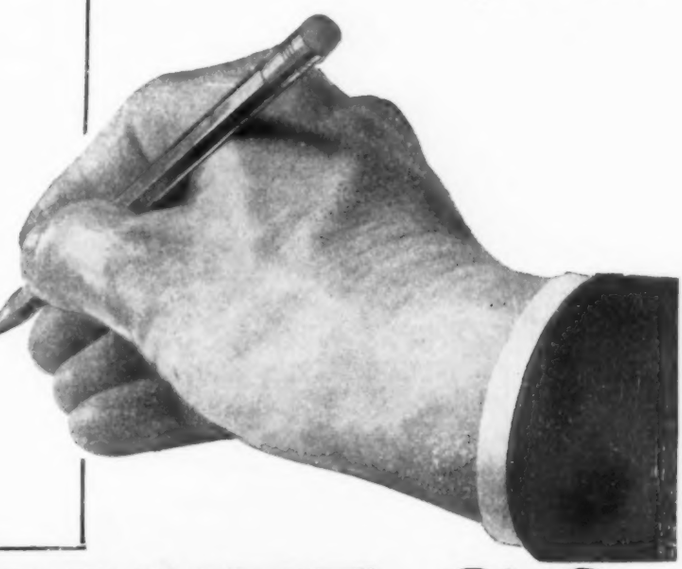
Their versatility in no way impairs the precision of their output, however, nor is quality lessened due to high production figures.

Broaching is a simple operation that positively guarantees duplication. This is invaluable to makers of machines or appliances having interchangeable parts. It prevents delay when making repairs by absolutely eliminating fitting.

Reduce your several machining operations to a single, simple process. Resolve to cut expenses by utilizing machine tools that do not require the attention of highly skilled mechanics. Avoid the expense of work-holding fixtures and enjoy the satisfaction that comes through producing a product of higher quality.

You can do all these, and more, by insisting on the use of broaches and broaching machines manufactured by the

J.N. LAPOINTE CO. of NEW LONDON



J.N. LAPOINTE CO.
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DETROIT OFFICE: 11 HARPER AVE.

2074-L

Makers of Broaching Machines and Broaches.

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Representative for Italy:
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The Advantage of Large "Gather"

This brake staff is made of 1¼-in. diameter stock, and 14¼-in. of stock enter into the upset. The job is made in one blow and one heat on the

NATIONAL

Heavy Pattern Forging Machine

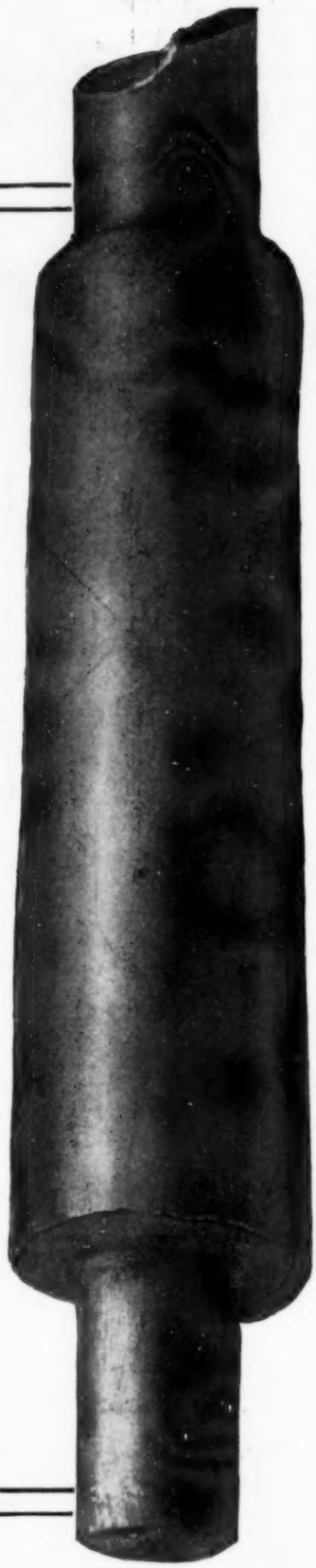
(Steel Bed)

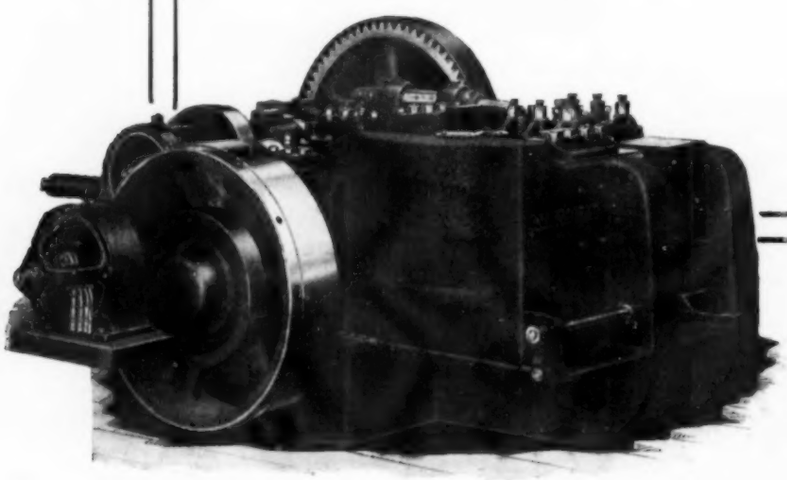
The upset is 1¾-in. diameter x 7-in. long, and the bearing end is swaged to 1-in. diameter.

The large gathering capacity of the National makes it the economical Forging Machine for your plant also. It handles a wider range of forging work, and on jobs such as the above, it means fewer operations and ofttimes eliminates a heat.

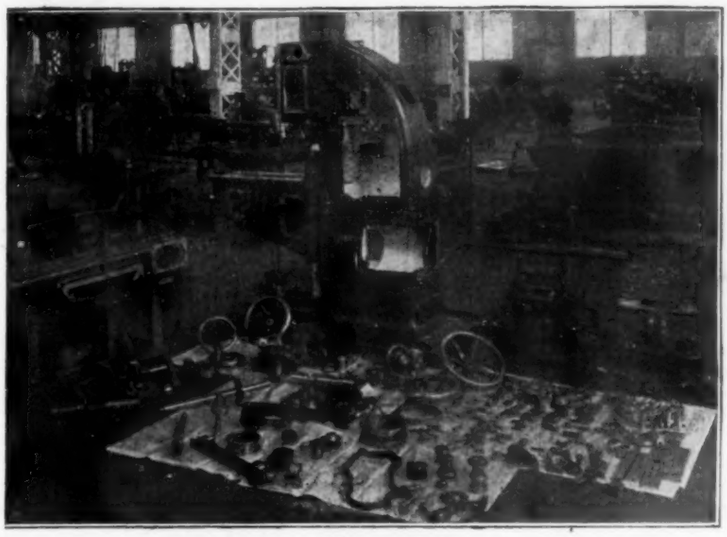
For details of the above job and dies ask for National Forging Machine Talk No. 13.

The National Machinery Company
Tiffin, Ohio, U. S. A.





Are you receiving National Forging Machine Talks?



Large Vertical Miller ready for assembly

ReMANUFACTURED
-(ORIGINATED BY US)-
MACHINE TOOLS

TRADE MARK

The Sole Difference

Between Our Process and the Manufacturer's

IS THE FOUNDRY

We plane the flat surfaces; we refinish or replace every wearing part; we rebush where necessary and re-align every bearing and we refinish the completed machine—in fact, we do everything the manufacturer of the original machine did, *except make the castings.* And this single difference is actually an advantage of Remanufactured machines.

You know, of course, that the *material* in a used machine has not depreciated, but have you ever stopped to consider that in reality it has improved—is seasoned—free from the tendency to warp that is a known drawback of castings only a short time out of the sand?

HILL, CLARKE & CO.
OF CHICAGO

649 WASHINGTON BLVD.

Our Guarantee: **Your money back if you return machine within 30 days of date of shipment freight prepaid. No excuses necessary!**

LATHES

4—40-in. x 18-ft. Fifield Engine, Trip. Gd. C.R.
4—40-in. x 12-ft. Fifield Engine, Trip. Gd. C.R.
23—32-in. x 12-ft. Pittsburgh Engine, D.B.G., C.R., Q.C.G.
3—30-in. x 20-ft. American Gd. Hd. Engine, C.R., Q.C.G.
6—30-in. x 11-ft. American Gd. Hd. Engine, C.R., Q.C.G.
5—26-in. x 20-ft. Bridgeford Engine, D.B.G., C.R., Q.C.B.
10—26-in. x 18-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
30—26-in. x 12-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
75—26-in. x 10-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
3—26-in. x 10-ft. Putnam Motor Driven Engine, C.R., Q.C.G.
33—26-in. x 10-ft. Niles Engine D.B.G., C.R., Q.C.G.
10—25-in. x 10-ft. LeBlond Engine, D.B.G. C.R., Q.C.G.
58—21-in. x 10-ft. LeBlond Engine, D.B.G. C.R., Q.C.G.
105—20-in. x 8-ft. American Engine, D.B.G. C.R., Q.C.G.
16—20-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G., P.F.T.
3—20-in. x 8-ft. American Gd. Hd. Engine.
14—20-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
35—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
65—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
18—18-in. x 8-ft LeBlond Engine, D.B.G., C.R., Q.C.G.
8—18-in. x 8-ft. Boye & Emmes, D.B.G., C.R., Q.C.G.
21—18-in. x 8-ft. Boye & Emmes, D.B.G., C.R., Q.C.G.
4—17-in. x 6-ft. LeBlond Rapid Production, C.R., Q.C.G.
20—17-in. x 6-ft. LeBlond Mfr's Automobile.
7—16-in. x 6-ft. Reed Engine, C.R.
42—14-in. x 6-ft. Reed Ex. Hvy. Pl. Engine.

GRINDERS

1—10-in. x 30-in. Landis Plain.
1—8-in. x 48-in. Thompson Surface.
1—No. 2 Bath Surface.
1—No. 10 Brown & Sharpe Pl.
1—No. 70 Heald Internal.

DRILLS

1—No. 2-K Henry & Wright.
1—No. 4-B Henry & Wright.
2—No. 6-B Henry & Wright.
4—No. 3-ft. American Sensitive.
3-ft. Fosdick.

MILLING MACHINES

15—No. 6 Whitney Hand.
5—No. 3½ Fox.
1—No. 2 Becker Plain.
2—18-in. Cincinnati Auto Millers.
3—No. 7-H Becker-Lincoln.

SHAPERS AND PLANERS

1—24-in. Rockford.
1—26-in. Springfield.
10—26-in. Niles-Bement-Pond.
1—28-in. Gould & Eberhardt.
1—24-in. x 24-in. x 8-ft. American.
2—36-in. x 13-in. x 14-ft. Niles Frog.
1—42-in. x 36-in. x 12-ft. Pon.
1—56-in. x 56-in. x 10-ft. Gray.

TURRET LATHES

5—19-in. LeBlond Universal.
34—19-in. LeBlond Combination.
16—20-in. American Combination.
12—21-in. LeBlond Universal.
32—24-in. Steinle.
3—No. 3-A Warner & Swasey.

BORING MACHINES

1—3½-in. bar Binsse Horizontal.
1—4-in. bar Niles Horizontal.
1—2-Spindle Beaman & Smith Cylinder.

MISCELLANEOUS

1—42-in. Niles Vertical Boring Mill.
1—2¼-in. Cleveland Automatic.
4—6-in. x 14-in. P. & W. Thread Millers.
1—30-in. Flather Gear Cutter.
2—No. 56 Toledo S. S. Presses.

PRODUCTION EQUIPMENT

Special offerings for this week

We are able to make immediate delivery to any point —excellent railway service

VERTICAL BORING MILLS

100-in. Betts, three heads, very heavy.
76-in. Bets, 2 swivel heads, heavy.
60-in. Niles-Bement-Pond, 2 swivel heads, S.P.D.
60-in. Bickford, two heads.
48-in. Colburn, 2 swivel heads, modern with rapid traverse to heads.
Two (2) 42-in. Bullard, swivel and boring heads.
36-in. Bullard Vertical Turret Lathe, side-head type.

DRILLS—RADIAL

7-ft. Niles, plain, heavy type.
6-ft. Baush, belt or motor drive, very heavy.
6-ft. Bickford, semi-universal, gear box drive.
5-ft. Niles-Bement-Pond, heavy duty, motor driven.
5-ft. Universal Co.'s full Universal.
4-ft. Gang, tapping attachment, modern.
3½-ft. Gang, swinging circular table.
6-ft. Niles-Bement-Pond, full universal Radial Drill, motor driven.
6-ft. Dreses full univ. Radial drill, motor driven.

GRINDERS

No. 28 Brown & Sharpe, 18-in. x 96-in., good as new, weighs 18,000 lb.
Landis 10-in. x 36-in. Universal.
No. 23 Brown & Sharpe Cylinder.
No. 15 Besley Pattern Maker's Disc (30 in.)

GEAR CUTTERS

60-in. Gould & Eberhardt, spur and bevel, with hobbing attachment.
36-in. x 10-in. Gould & Eberhardt, spur.
36-in. x 10-in. Flather.
36-in. Fellows Gear Shaper.

ENGINE LATHES

60-in. x 20-ft. Fifield, C.R., P.C.F.
52-in. x 22-ft. New Haven, triple geared.
48-in. x 20-ft. Fifield, C.R., P.C.F.
42-in. x 21-ft. New Haven, C.R., P.C.F.
36-in. x 14-ft. Putnam, heavy duty, taper attachment.
30-in. x 12-ft. Israel Johnson, heavy duty.
28-in. x 12-ft. Fay & Scott, C.R., P.C.F.
26-in. x 12-ft. Putnam, heavy duty.
20-in. x 8-ft. Lodge & Shipley geared head, S.P.D.

MILLING MACHINES

Eight (8) No. 5C BECKER VERTICAL MILLERS—NEW.
Two (2) 50-in. x 8-ft. Ingersoll Slab Millers.
No. 3 Le Blonde high power, heavy duty, like new.
No. 3 Le Blond plain, all geared feeds.
No. 3 Hendey Plain, all geared feeds.
No. 2 Hendey Plain, all geared feeds.
No. 7H Becker Lincoln type, like new.
Two (2) No. 6 Whitney Hand Millers, like new.
8—No. 5C Baker vertical milling machine—NEW.

PLANERS

48-in. x 48-in. x 14-ft. POWELL, 4 HEADS, ALMOST NEW.
42-in. x 42-in. x 12-ft. Pond, 2-rail heads.
36-in. x 36-in. x 18-ft. Pease, 2-rail heads.
36-in. x 36-in. x 12-ft. Niles-Bement-Pond, 3 heads.
32-in. x 32-in. x 8-ft. Niles, 2 rail heads.
30-in. x 30-in. x 6-ft. Gray, 1 rail, 2 side heads.
84-in. x 84-in. x 10-ft. Fellers Planer, 4 heads.
48-in. x 48-in. x 16-ft. Bement-Niles Planer, 4 heads.

PRESSES

No. 512 Bliss Special Triple Acting, 33 tons pressure, excellent condition.
Five No. 6 Farrel, geared, 8-in. stroke.
Five Farrel D.A., 1-in. to 3-in. strokes.
DD4 Ferracute double acting, roll feed, open back, inclinable.

PUNCHES AND SHEARS

32-in. Sellers Punch and Shear. Punches 2-in. hole through 1½-in. thickness. Shears 2½-in. round. Very heavy type.
Carlin Alligator Shear, capacity 5-in. rounds.

GRAVES MACHINERY EXCHANGE

Warehouse and R. R. Siding: Johnson Ave. and Monitor St., Jersey City, N. J.

Offices: Suite 482, 50 Church St., New York City, New York

TELEPHONE: CORTLANDT 665

NEW AND USED MACHINE TOOLS

PRESSES

No. 1 A Adams Foot Press
No. 1½ Bosworth Type Foot Presses
No. 3 Standard Heavy Duty Inclinable Hand Screw Press
No. 12 Bliss Hand Screw Press
No. 1 Bliss Arch Screw Press
No. 2 Adams Screw Press
No. 3 Adams Screw Press
No. 5 Stiles Pattern Bliss Power Press
No. 4 Manville DA Power Presses
No. 5A Standard SA Power Presses
No. 8 S Standard SA Power Press
No. 1C Standard SA Power Press
No. 52 FF Straight Sided Power Press
40 Ton Riehle Fuse Loading Presses
100 Lb. Standard Plain Drop
150 lb. Standard Plain Drop
200 lb. Standard Plain Drop

LATHES

15 x 5 Vernon Q.C.G.
14 x 6 Rockford Economy Q.C.G.
14 x 6 Vernon Tool Room Q.C.G. taper, draw in, oil pan
16 x 6 Monarch Q.C.G.
15 x 6 South Bend
15 x 8 Sidney Q.C.G.
20 x 10 Sidney Q.C.G.
25 x 14 Sidney Q.C.G.

SCREW MACHINES

No. 2 Brown & Sharpe Automatic, late type (4)
No. 2G Brown & Sharpe Automatic, late type
No. 515 National-Acme
No. 4 Warner & Swasey, type GFH 1½ in. capacity
2 x 24 Jones & Lamson Cone Driven
No. 22 Garvin Monitor Turret
20-in. Reid Chucking Lathe
21-in. Gisholt Turret Lathe

GRINDERS

Greenfield Cutter and Reamer
Cleveland Profile
No. 2 Reed Surface
No. 16 B & S Plain 10 x 72
No. 2 B & S Universal 12 x 36
18 in. x 120 in. Norton Plain

MILLING MACHINES

Becker Heavy Hand Millers
No. 0 Bristol Hand Miller, P.F.
Bickford Hand Miller P.F.
No. 1 Standard Hand Miller Vertical Spline
No. 3 Bristol Vertical
No. 13 Garvin, Plain B.G.
No. 4 Hendey, Lincoln type
No. ½ Van Norman Duplex
Pratt & Whitney Automatic

PLANERS

17 in. x 17 in. x 4 ft. Whitcomb-Blaisdell
17 x 20 x 5 ft. Whitcomb-Blaisdell
24 x 24 x 6 ft. Powell
30 in. x 30 in. x 8 ft. Cleveland Open Side
30 in. x 30 in. x 10 ft. Powell two heads
30 in. x 42 in. x 14 ft. Whitcomb-Blaisdell

SHAPERS

7 in. Rhodes
8 in. Boynton & Plummer
16 in. Ohio Plain
16 in. Kelly B.G.
16 in. Gould & Eberhardt B.G.
18 in. Springfield
20 in. Ohio B.G.
24 in. Walker Old Style Geared
No. 12 GENUINE Pratt & Whitney Profiler

BORING MILLS

No. 1 Beaman & Smith Horizontal Boring, Milling and Drilling Machine, 3 inch spindle
No. 1 Cleveland Horizontal, Boring, Milling and Drilling Machine
51 in. Bertram Vertical Boring and Turning Mill

DRILLS

14 in. U. S. Sensitive
16 in. Millbury Sensitive
1 spindle Taylor & Fenn Sensitive
3 spindle Reed-Prentice BB
4 spindle Reed-Prentice BB
4 spindle Allen BB
4 spindle Rockford PF
6 spindle Taylor & Fenn PF
36 in. Foote Burt Heavy Duty
3 ft. Taylor & Fenn Sensitive Radial
4 ft. Fosdick Cone Driven Radial
22½ in. Barnes Stationary head
21-in. Snyder B. G.

WOODWORKING MACHINERY

No. 0 Kidder Saw Table
12-in. Crescent Jointer
36-in. Crescent Band Saw
24-in. x 8-in. Williamsburg Double Surfacer
Pocket Boring Mortiser
Pulley Cutter Machine

MISCELLANEOUS

Waterbury Farrel Foundry Rolling Mill 14-in. x 16-in. arranged for motor drive
Gould & Eberhardt rack cutter 8 ft. capacity
No. 3A Cincinnati Automatic Gear Cutter
No. 1A High Speed Plain Riveting Machine.
No. 14 Higley Cold Saw

BROWNELL MACHINERY CO.

PROVIDENCE, R. I.

An Unusual Lot of Tools of the Better Kind

List of exceptional equipment which is in first-class condition and READY FOR IMMEDIATE DELIVERY

LOCATED AT WATERTOWN, N. Y.

LARGE TOLEDO PRESSES, including:

4—No. 59 double geared straight column; stroke 12-in.; weight, each, approx. 50,000 lbs.

1—No. 58 double geared straight column; stroke 14-in.; weight, each, approx. 33,000 lbs.

3—No. 57 double geared straight column; stroke 18-in.; weight, each, approx. 20,000 lbs.
4—No. 666 Knuckle-Joint Embossing; stroke 2¼-in.; weight, each approx. 80,000 lbs.
6—No. 857 geared Rack and Pinion Reducing; weight, each, approx. 22,000 lbs.

LOCATED AT OUR WAREHOUSE IN NEW YORK CITY

SPECIALS:

18—**No. 1-B Foster Universal Turret Lathes**—single pulley drive—used two months.
16—**No. 20 Bryant Chucking Grinders**—some NEW—others very slightly used.

VERTICAL BORING MILLS

1—84-in. Gisholt, 2 heads on rail, single pulley drive, NEW.
1—72-in. Niles, 2 heads on rail, cone pulley drive.
1—60-in. Niles, 2 heads on rail, cone pulley drive.
2—42-in. Baush, 2 heads on rail.
1—36-in. Bullard Vertical Turret Lathe with side head, rapid production type.

HORIZONTAL BORING MILLS

1—No. 31 Lucas single pulley drive.
1—No. 2 Rockford boring and drilling machine, motor drive, direct current motor.
2—Bement-Niles.

PLANERS: All latest type and design:

1—48 x 48 x 30 Putnam, 4 heads.
1—36 x 36 x 12 Woodward & Powell, 2 heads.
3—26 x 26 x 10 Putnam, 2 heads, NEW.
6—26 x 26 x 8 Putnam, 2 heads, NEW.
1—30 x 30 x 8 Powell, 2 heads.
1—36 x 36 x 12 Gray, 2 heads.
1—24 x 24 x 6 Gray, 1 head.
1—30 x 30 x 10 Flather, 1 head.
1—36 x 36 x 14 Ohio, 4 heads, heavy duty motor driven. Set up but never used.

MILLING MACHINES

1—No. 3 Kempsmith, plain.
1—No. 2 A Fox Universal, NEW.
1—No. 2 LeBlond heavy duty, plain.
40—No. 6 Whitney hand.
30—Stand Hand Power Feed.
8—No. 10 Pratt & Whitney hand.
8—No. 0 Bristol hand.
10—No. 3½ Fox hand.
6—4-in. Pratt & Whitney spline.
8—2-in. Pratt & Whitney spline.

DRILLS

2—Henry & Wright single spindle high speed.
15—Allen high speed, 2, 3, 4, 5 spindle.
1—25-in. Silver back geared, NEW.
1—28-in. Cincinnati with tapping attachment.
1—24-in. Prentice.
6—Moline Hole Hogs.

GEAR CUTTERS

1—48-in. Cincinnati.
1—36-in. Cincinnati.
1—36-in. Brown & Sharpe.
1—No. 4 Farwell gear hobber.
2—8-in. Hercules gear hobbers, NEW.

RADIAL DRILLS

4—6-ft. Baush, cone pulley drive, NEW.
1—6-ft. Reed-Prentice motor-driven single pulley drive.
1—3-ft. Fosdick, cone drive.

GRINDERS

1—10 x 96 Norton plain.
2—10 x 36 Norton plain.
2—10 x 36 Modern plain.
2—10 x 30 Modern plain.
1—No. 11 Brown & Sharpe plain.
1—6 x 32 Norton plain.
1—No. 2 Brown & Sharpe universal.
1—No. 2 Modern universal.
1—No. 1 Landis universal.
1—No. 1 Fraser universal.
2—No. 1½ Walker Surface with magnetic chuck
1—La Salle Surface with magnetic chuck.
2—No. 70 Heald.
70—No. 1 Blount Bench Grinders.

LATHES:

1—42 x 17 Pond.
6—24 x 12 Boye & Emmes quick change gear.
4—22 x 12 Creaves Klusman quick change gear.
1—25 x 10 LeBlond quick change gear.
1—20 x 12 Prentice single pulley drive, geared head.
1—18 x 6 Reed quick change gear.
4—18 x 8 Rockford Economy quick change gear.
6—16 x 6 Oliver with pan and pump, quick change gear.
3—12 x 5 Hercules.
6—3½ x 60 Lo-Swing.
2—8 x 84 Lo-Swing.
20—Sidney medium pattern quick change gear Lathes with 6-ft. to 12-ft. beds and 14-in. to 20-in. swings, NEW.

TURRET LATHES

1—No. 4 Warner & Swasey screw machine.
7—No. 4 Brown & Sharpe screw machines.
1—No. 12½ Garvin screw machine, fully equipped.
1—No. 3 Foster, geared head, single pulley drive, fully equipped.
1—No. 5 Foster geared head, single pulley drive, fully equipped.
8—Wood Tilted Turret Lathes, 1½-in. capacity.
10—No. 6-A Potter & Johnson, latest type.
5—No. 0 Foster.
2—No. 2 Warner & Swasey.

MISCELLANEOUS

1—No. 54 National Acme automatic motor driven
1—Rheinecke Relieving Machine.
1—Flather Relieving Machine.
1—Becker Backing-Off Machine.
1—Adriance No. 4 inclinable power press.
1—Leffler No. 3 inclinable power press.
1—Toledo No. 1 inclinable power press.

PARTIAL LIST

We offer only machines that we own outright. We guarantee them to be exactly as represented. After you have bought once, you will buy again!

MOREY AND COMPANY, INC.

BROOME AND LAFAYETTE STS. 'Phone, Canal 5360 NEW YORK CITY

UNUSUAL SELECTION OF MACHINE TOOLS

PRICES RIGHT AND ALL MACHINES GUARANTEED "A-1" CONDITION

80 PRATT AND WHITNEY SEMI-AUTOMATIC MILLING MACHINES TABLE 18 x 6½ FEED OF TABLE 12-in. MACHINES ARE AS SHOWN **$500**

100

Becker No. 7H Lincoln Type Milling Machines

$250 each

Table, 29-in. x 9-in.

Feeds

Longitudinal, 19½-in.
Cross, 7-in.
Vertical, 9-in.
Weight, 2,400-lb.

200

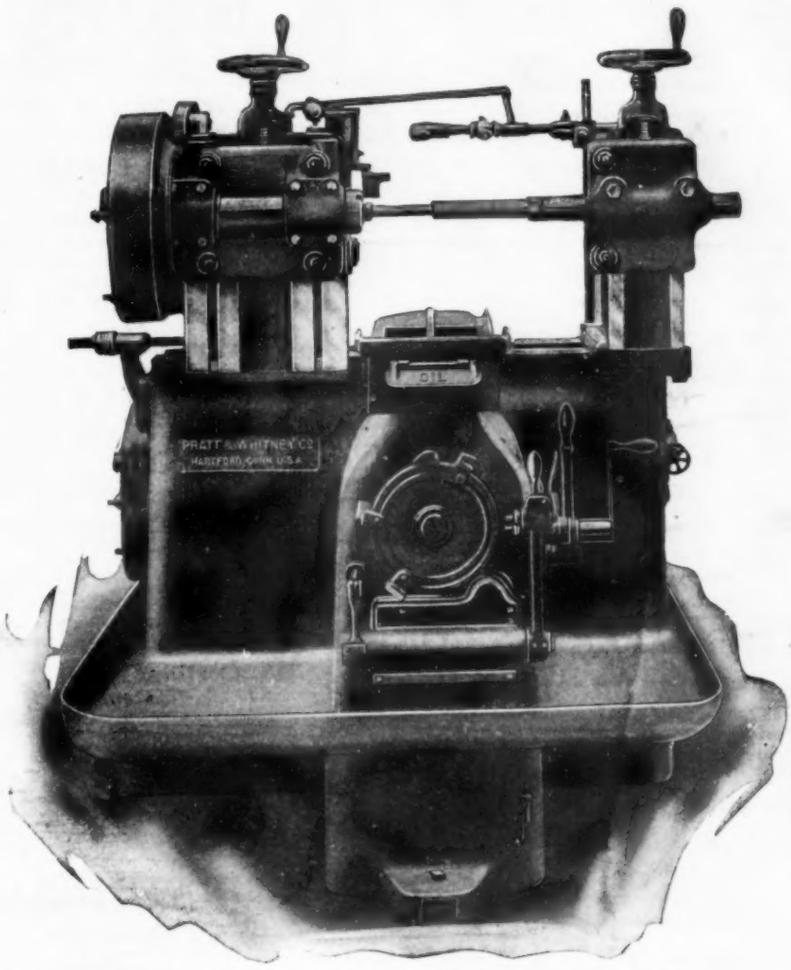
2-Spindle Putnam Profilers

$200 each

Table, 12-in. x 5-in.

Feeds

Table, 20-in.
Cross slide, 27-in.
Up and down, 3-in.
between uprights, 18½-in.



100

Hendey No. 4 Lincoln Type Milling Machines

$250 each

Table, 24-in. x 6-in.

Feeds

Longitudinal, 20-in.
Cross, 5-in.
Vertical, 8-in.
Weight, 2,200-lb.

100

Victor Loew Lincoln Type Milling Machines

$225 each

Table, 26-in. x 6-in.

Feeds

Table, 20-in.
Cross, 5-in.
Vertical, 8-in.
Weight, 2,000-lb.

LATHES

57-in. x 28-in. x 14-ft. Putnam.....$1800
Sliding bed gap type, heavy construction with all gears, countershaft, etc.

44-in. x 26-in. x 8-ft. McCabe two-spindle.....$1250

3—36-in. x 14-ft. Putnam triple geared.....$2600
Geared face plate drive, taper attachment, etc.

3—26-in. x 12-ft. Putnam semi-quick change.....$1500
Heavy type double back geared, regular equipment.

25-in. x 12-ft. Le Blond quick change gear.....$1750
Heavy duty type, double back geared, regular equipment.

24-in. x 12-ft. Lodge & Shipley quick change gear....$1250

20-in. x 8-ft. Whitcomb-Blaisdell.....$1200
Single pulley drive, late type, quick change gear.

18-in. x 8-ft. Lodge & Shipley quick change gear.....$750
Taper attachment and regular equipment.

18-in. x 8-ft. Greaves-Klusman.....$700
Semi quick change type with regular equipment.

18-in. x 6-ft. Greaves-Klusman.....$650

16-in. x 6-ft. Greaves-Klusman.....$750
Quick change gear type, regular equipment.

DRILLS

2—3-ft. Canedy Otto Radial.....$450 each

4—4-Spindle 20-in. Barnes (Haunchback type)....$800 each
All geared feed type.

2—4-Spindle Henry & Wright H. S.....$325 each

2—Avey Single Spindle H. S.....$225 each

9—Leland Gifford H. S.....$225 each
Single spindle, equipped with motor 110 volt, A.C. 60 cycle.

Drills without motor.....$200 each

POWER PRESSES

No. 27 Bliss Knuckle Joint Embossing.....$12,000
1000 ton pressure on ram, weight 33½ ton.

2—No. 77½ Bliss Straight Side double geared..$8,500 each
Tie bar frame, friction clutch, weight 17½ ton.

10—No. 60½ Bliss Geared Reducing.....$2500 each
Rack and pinion movement, weight 6½ ton.

9—No. 2 Pratt & Whitney Trimming (new).....$750 each
Have side sprue attachment, weight 3400 pounds.

GEAR HOBBERS

Schuchardt & Schutte.....$1500

Pfauter.....$1000

Gould & Eberhardt.....$1000

SHAPERS

30-in. Morton Draw Cut.....$1000
Heavy type with vise and countershaft.

20-in. American with vise and countershaft.....$950

18-in. Ohio with vise and countershaft.....$500

MILLING MACHINES

No. 3 Cincinnati Plain.....$1500
Equipped with 10-in. Cincinnati dividinghead and tailstock.

No. 2 Cincinnati Universal.....$1150
With full universal equipment.

No. 1 Brown & Sharpe Universal.....$950
With full universal equipment.

4—No. 15 Garvin Plain.....$550 each

MISCELLANEOUS

No. 3 Modern Universal Grinder.....$1800
Brand new machine, capacity 14-in. x 40-in., complete with full universal equipment.

2—No. 4 Millholland Screw Machines.....$1200 each
Brand new machines, capacity 2¾-in. geared friction head power feed to turret.

3-inch Pratt & Whitney Turret Lathe.....$850

No. 330 Stoll Geared Squaring Shear.....$600
Capacity ⅜ inch, soft steel 31 in. between housings.

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34 x 18 ft. LODGE & SHIPLEY, DOUBLE BACK GEARED, HEAVY DUTY QUICK CHANGE LATHE.
25 x 10 ft. LEBLOND, DOUBLE BACK GEARED, HEAVY DUTY QUICK CHANGE LATHE.
25 x 14 ft. LEBLOND, DOUBLE BACK GEARED, HEAVY DUTY, QUICK CHANGE LATHE.
54-in. NILES-BEMENT-POND STANDARD BORING AND TURNING MILL, 2 HEADS AND CHUCKING EQP.
No. 3 LEBLOND, HEAVY DUTY, UNIVERSAL MILLER, REGULAR EQUIPMENT AND VERTICAL ATTACH.
No. 2B, MILWAUKEE, HEAVY DUTY, UNIVERSAL MILLER, REGULAR EQUIPMENT, S.P. DRIVE.

LATHES

20 x 8 ft. Springfield BG SP Lathes.

No. 3 Gardner Polishing Lathe.

17 x 8 ft. Leblond Heavy Duty BG Lathes.

19 x 10 ft. Leblond Heavy Duty QC Lathes.

19 x 12 ft. Leblond Heavy Duty DBG, QCG and Taper Attachment Lathe.

DRILLS

24-in. Fosdick Plain Radial Drill.
20-in. Excelsior Back Geared Drill.
20-in. Rockford Drill with tapping attachment.
24-in. Rockford Drill with tapping attachment.
26-in. Aurora Upright SH Drill.
No. 2½ Avey 2 Spindle HS Drill with tapping attachment.
Meyers Bench Drill and Stand.

20-in. ROCKFORD BACK GEARED SHAPER.
No. 5 MARVEL AUTOMATIC HS HACK SAW.
No. 2 ROCKFORD HAND MILLER WITH DRAW IN ATTACHMENT, ARBORS, ETC.
P3 FERRUCUTE POWER PRESS.
1¼-in. CAP. RELIANCE BOLT CUTTER.
BLOUNT WET GRINDER
HARDENING FURNACE AND BLOWER
INTERNATIONAL TIME CLOCK
FLOOR CRANE
FOUR-WHEEL TRUCK

Large Quantity of Small Tools Consisting of Drills, Reamers, Milling Cutters, etc.
Belting Pulleys Hangers and Shafting Office Furniture

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AUTOMATICS AND TURRET LATHES

1—⅝-in. Cleveland Model A Automatic.
1—1-in. Cleveland Model A Automatic.
2—No. 2 Pratt & Whitney Screw Machines—⅝-in. Wire Feed.
1—2-in. x 24-in. Jones & Lamson, Cone Drive.

BORING AND DRILLING MACHINES

1—No. 12 P. & H. Horizontal Boring, Drilling and Milling Machine, Latest type, Motor Driven.
1—60-in. Niles-Bement-Pond Horizontal Boring, Drilling and Milling Machine, latest type.
1—72-in. Bullard Vertical Boring and Turning Mill, 2 heads on cross rail.

DRILLING MACHINES

2—No. 26—16-in. Canedy Otto, Sensitive Drills.
3—No. 36—26-in. Canedy Otto Back Geared Power Feed Drills.
1—3½-ft. Arm Canedy Otto Radial.

GRINDERS

1—No. 2 Norton Universal Tool and Cutter Grinder, Complete.
1—No. 2 LaSalle Automatic Surface Grinder.
1—No. 2 Manhattan Surface Grinder.
1—No. 70 Heald Grinder.

LATHES

1—14 x 4 Pratt & Whitney.
1—16 x 6 Blair.
1—16 x 6 Davis.
1—16 x 7 Union.
2—18 x 8 Greaves-Klusman.
1—18 x 10 Robbins.
1—26 x 11 Walcott.

MILLING MACHINES

1—No. 1 Dow.
3—No. 12 Pratt & Whitney, semi-automatic billing machines, complete.
1—No. 14½ Brainard Universal Miller, complete with dividing heads.

SHAPERS

1—16-in. Hendey Friction Tool Room Shaper.

MISCELLANEOUS

2—6-in. x 6-in Peerless High Speed Hack Saws.
1—9-in. x 9-in. Peerless High Speed Hack Saw.
1—6-in. x 6-in. Millers-Falls Hack Saw.
1—Type A Manhattan Screw Press.
We carry a complete line of Universal and Independent Lathe Chucks, and Barker Wrenchless Chucks.

The Morton Machinery Company
139 N. Third St., Philadelphia, Pa.

Machinery in Stock

FOR IMMEDIATE DELIVERY

No. 0 Brown & Sharpe Automatic Screw Machine.
2¼-in. Gridley Automatic Screw Machine, motor driven.
10 Warner & Swasey No. 4 Screw Machines, back geared friction head with air chucks.
10 Bardon Oliver No. 4, back geared, friction head with air chucks.
1½-in. Pratt & Whitney Screw Machine, friction head, power feed to the turret.
No. 2 Brown & Sharpe Grinder Universal, complete.
No. 3 Brown & Sharpe Tool and Reamer Grinder, complete.
No. 2½ Consolidated Power Press.
No. 2 Consolidated Power Press.
No. 103 V. & O. Power Press, dial feed with 6-in. stroke.
Zeh & Hahnemann Dinken Press.
No. 7 Zeh & Hahnemann Screw Press, power feed, belt driven.
No. 10 Zeh & Hahnemann Screw Press, power feed, belt driven.
Leland Gifford 12-in. single spindle drill with tank and oil pump.
Leland Gifford 12-in. 3-spindle drill with tank and oil pump.
Taylor & Fenn 5-spindle high speed drill.
20 new 20-in. Upright Drills, back geared.
24-in. Schneider back geared and sliding head drill.
4-ft. American Radial Drill, gear box drive.
20 Monarch's No. 150 Tilting Furnaces for brass foundry use.
10 Stewart Hardening Furnaces No. 21.
7 extra large Hardening Furnaces.
30-in. x 30-in. x 12-ft. Whitcomb Planer, complete.
42-in. x 14-ft. Schumacker & Boyed Engine Lathe, triple geared, geared face plate, quick change and hollow spindle, complete.
6-in. Shaper, 15-in. Hendey Shaper, 17-in. Juengst Shaper.
50 Engine Lathes of various sizes and makes.
25 Milling Machines, various sizes and makes.
8 Swedging Machines of various sizes.
Grant Riveters.
10 ton of Taps Reamers, high speed drills and high speed tool steel.
300 various machines in stock for immediate delivery at a low price.

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Hangers—All sizes—all shapes—mostly Dodge make—capillary and self-oiling.

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PARTIAL LIST

DRILLS

20-in. Prentiss Drill, geared head.
20-in. Hamilton Plain Drill Press.
20-in. Excelsior Drill, back gear, new.
24-in. Rockford Drill.
24-in. Sliding Head Drill.
26-in. Barnes Camel Back Drill Press.
30-in. Rand Drill Press, sliding head.
32-in. Bement Drill, sliding head.
32-in. Pond Drill Press, sliding head.
36-in Fitchburg Drill.
2-Spindle Cincinnati Drill.
3-Spindle Bausch Drill.
2-Spindle Segurney Drill.
3½-ft. Pond Radial Drill.
4-Spindle Foote-Burt Drill.
Henry & Wright Single Spindle Drill.

GRINDERS

No. 1 Cincinnati tool and cutter.
No. 1 Fraser.
No. 1½ Cincinnati Universal.
No. 1½ Landis Universal.
No. 2 Brown & Sharpe surface.
No. 2 Cincinnati 12 x 30 Universal.
No. 3 Brown & Sharpe Universal.
No. 4A Cincinnati Universal, 16 x 72.
No. 5 Bath Duplex with pump tank.
No. 7 Gardner, double disc.
No. 14 Besley.
22 x 36 Bridgeport cyl.
Narragansett Rotary.
Reed Surface with magnetic chuck.
Yankee Twist Drill Grinder.
Newbold Circular Shear.

BORING MILLS

3-in. Niles Bement horizontal.
No. 26 Espen Lucas horizontal, 4-in. bar.
42-in. Bullard.
60-in. Niles, vertical, s.p.d.
Binsse horizontal, 1½-in. bar.

SHAPERS

24-in. Fellows gear.
24-in. Gould & Eberhardt.
24-in. Kelly.
26-in. Smith & Mills.

LATHES

11 x 4 Mann.
13 x 6 Fay & Scott.
14 x 6 Fay & Scott.
14 x 6 Prentiss.
14 x 8 Hamilton.
14 x 6 Monarch.
14 x 6 Reed.
14 x 6 Sebastian.
14 x 6 Worcester.
16 x 6 American, geared head.
16 x 6 Chard, quick change.
16 x 6 Hendy, quick change.
16 x 6 South Bend Engine.
18 x 6 Monarch, geared head, taper attachment.
18 x 8 Blaisdell.
18 x 8 Superior, q.c.g., d.b.g., new.
20 x 10 Boye & Emmes.
20 x 10 Hendy Yoke head.
20 x 8 Prentiss, geared head.
20 x 8 Reed.
20 x 8 Whitcomb Blaisdell.
22 x 7 Reed.
28-in. Conradson turret.
30 x 8 Blaisdell.
30 x 12 Putman.
No. 3 Woods Tilting Turret.
No. 5½ Sloan & Chase.
No. 6 Potter & Johnson turret.
Ames Bench, C. S.
Greaves & Klusman.

SCREW MACHINES

No. 1 Hartford.
1½-in. Cleveland.
2—No. 1¾ Gridley, multiple spindle.
No. 2 Garvin, hand, new.
2-in. Hartford automatic.
2-in. B & S semi-automatic.
No. 2 Pratt & Whitney hand, ⅜-in. capacity.
1—3½-in. National Acme, multiple spindle.
No. 3 Foster, 1⅛-in. capacity.
No. 4½ Gridley automatic.
No. 6 Warner & Swasey hand.
No. 52 National Acme, 4-spindle.
Hardon Oliver, ⅝-in. capacity.
Fay automatic.
10—No. 55 National Acme, automatic.

POWER PRESSES

No. 0 V & O, with dial feed.
No. 1 V & O, 1½-in. stroke.
No. 2 Adriance.
No. 3 Rockford.
No. 4 Adriance, inclinable, 2½-in. stroke.
No. 7 Standard.
No. 8 Standard.
No. 4 V & O, 5-in. stroke.
No. 18 Bliss.
No. 26B Bliss.
No. 23 Adriance.
No. 44 Adriance, 2-in. stroke.
No. 225 Adriance, geared.
No. P-3 Ferracute.
EG-52 Ferracute coining.
Atlas Power Press.
Farrel Foundry, double action.
Rueson, 1½-in. stroke.
Zeh & Hahneman horizontal reducing press.

PLANERS

16 x 16 x 4 Hendy.
22 x 22 x 4 Pond.
36 x 36 x 12 Pond.
48 x 48 x 8 Woodward & Powell.
24 x 24 x 6 Pond.

MILLERS

No. 2 Becker Universal.
No. 3 Becker, plain.
No. 3 Fox hand.
No. 3 Burke bench.
No. 4 Cincinnati Universal.
No. 3 Cincinnati Universal, vertical attachment.
No. 7 Becker.
No. 1¼ Garvin, plain.
No. 21 Garvin, plain.
No. 32 Kempsmith.
4 x 12 Pratt & Whitney thread.
10 x 28 Bristol, vertical.
Briggs Miller.
Lees Bradner thread, 3-in. capacity.
Standard hand and C. S.
U. S. Hand, new.
Wisconsin Hand.
43—Whitney Hand Millers.

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This lot of Machine Tools has just come in from a local tool room and won't be here long. Why not call and inspect at once, as they will not long remain available at these prices.

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No. 2½ Kempsmith Plain Miller, B.G., table 10 x 40, clutch counter, vise and arbor $800
No. 2 LeBlond Universal Miller, B.G., table 10 x 44, dividing heads, vise, clutch counter $1450
No. 13½ Garvin Plain Miller, B.G., table 10 x 40, vise, clutch counter, practically new $775
2—**No. 1 Hendey Norton Plain Millers,** table 10 x 32, quick change feed, arbor and counter, EACH $700

LATHES

14 x 6-in. Hendey Quick Change, compound rest, taper attachment, draw-in bar, fine condition $900
12 x 5 Hendey Quick Change, compound rest, taper attachment, oil pan bed, chuck, easily worth $800
14 x 6 Lodge & Shipley, hollow spindle, quick change, compound rest, etc. $590
2—**14 x 6 Davis Quick Change,** compound rests, fine condition, with chucks and standard equipment, EACH $575
13 x 6 Pratt & Whitney wt. carriage plain rest Lathe with chuck, a good lathe at $175
16 x 6 Pratt & Whitney Plain Rest Lathe, screw cutting and with chuck, at $225
28 x 13 Niles Bement Pond heavy duty Lathe, taper cabinet base, a fine lathe, little used $1500

PRESSES

1—**No. 2 Loshbough-Jordan 2½ stroke Press,** 200 lb. flywheel, NEW $385
4—**No. 3 Loshbough-Jordan 3-in. stroke Presses,** 1000 lb. flywheel, NEW, enroute, EACH $570
2—**No. 52A Farrel Fdry. Straight Side Presses,** 5-in. stroke, 15⅝-in. between uprights, 36 x 4⅝-in. flywheel, new presses, and have dial feeds if wanted, EACH $850
4—**East Iron 3½-in. stroke Presses,** weight each 1500 lb. Good condition, each $300
1—**EG52 Ferracute Press,** ¾-in. stroke $1200
2—**No. 101 V. & O. Dial Feed,** 5-in. stroke, excellent, EACH $600
1—**No. 1½, Bliss Toggle,** fine condition $2000

SHAPERS

10-in. Pratt & Whitney, with vise $275
15-in. Perkins Friction, no vise $375
16-in. American back gear, complete $750
20-in. Steptoe, single gear $750
16-in. Steptoe B.G., new $1025

GRINDERS

No. 1 LeBlond Universal Tool Room Grinder, fully equipped with chucks, internal attachments, gear cutter att., beautiful shape $775
Brown & Sharpe Cylindrical Grinder, 8-in. swing, 10 x 30 table, 15-in. centers, water attachment $600

SCREW MACHINES AND TURRET LATHES

1—**2A Warner & Swasey Screw Machine,** B.G., flat head, 2½-in. spindle, fine tool $750
12—**Milwaukee Screw Machines,** 1½-in. cap., fine condition, EACH $450
3—**1-in. cap. Pratt & Whitney** new type Screw Machines, A1 condition, EACH $350
2—**Foster Screw Machines,** ⅞-in. cap., very good condition, EACH $325
4—**Smur & Kamen Screw Machines,** 1¼ cap., very good condition, EACH $350

MISCELLANEOUS

36-in. Niles Turret Head Vertical Boring Mill, clutch table, condition like new $1750
Niles Horizontal Boring Mill, circular table, 2¼-in. bar, cone drive $850
6—**3-in. Lees-Bradner Thread Millers** for internal or external work, EACH $600
15-in. x 15-in. x 48-in. New Haven Planer, 3 "T" slots, fair condition $190
10—**New Britain Drop Head Polishing Jacks,** never used, cost $285 each. Price EACH $120
200 ft. 1½ shafting with hangers and pulleys.
4—**Peck 150 lb. Hammers,** short lift, nice condition, EACH $150

HERE'S A BUY FOR SOMEONE WHO INTENDS TO INSTALL A FUEL OIL SYSTEM

15,000 Gallon Oil Tank, 9-in. dia. x 33-ft. long, approx. 3000 gallons oil now in it.
7—W. S. Rockwell Co. No. 77 New No. 152) Internally fired revolving annealing and hardening oil Burning Furnaces, 8 ft. long x 30 in. dia., capacity 700 lbs. per hour. Hopper type feed, an excellent furnace in every respect.

THESE tools are all at our warehouse ready for immediate delivery and carry our guarantee. "Lucas Machinery Service" will save you lots of trouble if you buy your Second Hand Tools here.

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Two 72-in. Gould & Eberhardt Automatic Spur Gear Cutters.

60-in. Gould & Eberhardt Automatic Spur Gear Cutter.

36-in. Fellows Gear Shaper.

26-in. Brown & Sharpe Automatic Spur Gear Cutter.

24-in. Gould & Eberhardt Spur Gear Cutter.

PRESSES

No. 79½ Bliss Straight Side Press, 18-in. stroke, weight 95,000 lbs.

No. 3½ Bliss Straight Side Cam Drawing Press.

No. 87 Bliss double geared Reducing Press, 16-in. stroke, weight 25,000 lbs.

Two No. 666 Toledo Knuckle-Joint Presses, 2-in. stroke, 1,000 tons pressure, weight each 80,000 lbs.

No. 857 Toledo rack and pinion Reducing, stroke 5-in. to 40-in.—50 to 60 tons pressure—weight 22,000 lbs.

Two No. 856 Toledo rack and pinion Reducing, stroke 5-in. to 36-in., weight 15,000 lbs.

Three Bliss rack and pinion Reducing, stroke 4-in. to 42-in., weight 12,500 lbs.

Eleven No. 16 Bliss Horning and Wiring Presses.

Seven No. 10½ V & O Double Action Inclinable Presses.

SLOTTERS

68-in. Niles-Bement-Pond Geared Slotter.

Two 18-in. Betts Heavy Duty Slotters, motor drive.

16-in. Betts Heavy Duty Slotter, motor drive.

Two 16-in. Bement Slotters, cone drive.

10-in. Betts Slotter, heavy type, cone drive.

WE OWN THEM ALL

NEW CYLINDRICAL GRINDERS MUCH BELOW MARKET

Four No. 3 Modern, Universal Self-Contained, range 13-in. x 40-in.—full equipment, net weight 4,600 lbs.

Five 12-in. x 48-in. Modern, Plain Grinders, maximum grinding length 52-in.—full equipment, weight 8,000 lbs.

Two 12-in. x 60-in. Modern, Plain Grinders, maximum grinding length 64-in. — full equipment, weight 8,300 lbs.

One Van Norman No. 4 Internal Grinder with attachments, weight 1,800 lbs.

USED GRINDERS

One 16-in. x 66-in. Landis Universal.

One No. 1½ Landis Internal.

One Mummert Dixon Surface, capacity 14-in. x 26-in.

Two 8-in. Walker Vertical Ring Grinders.

One No. 6 Besley double head Disc Grinder.

MISCELLANEOUS

6-ft. Niles-Bement-Pond, Heavy Duty, Plain Radial Drill with tapping attachment.

600-lb. Steam Hammer, McDougal & Potter.

750-lb. Rope Lift Hammer, Toledo.

14-ft. Plate Planer, Hilles & Jones.

36-in. Detrick & Harvey Open Side Planer, 16-in. platen.

48-in. x 48-in. x 14-ft. Heavy Duty Patch Planer, 4 heads.

36-in. x 36-in. x 20-ft. Woodward Powell Planer, two heads.

Two 36-in. x 36-in. x 12-ft. Bickett Planers, one head.

30-in. x 30-in. x 8-ft. Pond Planer, one head.

Heavy Pattern Niles Plate Bending Rolls, 8-ft. 2-in. between housings, capacity ⅜-in. plate, Pyramid type.

No. 2 Hilles & Jones Straightening Rolls, capacity ⅝-in. plate, 6-ft. wide.

38 Racine Hack Saws, 6-in. x 6-in., belt drive.

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That will be a Valuable Addition to Your Plant

New Haven 36-in. x 36-in. x 10-ft. Planer, Single Head.
Whiton No. 2 Automatic Gear Cutter, Spur, Worm.
Henry & Wright 2-spindle BB Sensitive Drill.

Blount No. 1 Floor Grinder, with C/S.
Bardons & Oliver No. 4, 18-in. Turret Lathe.
Pratt & Whitney 12-in. x 6-ft. Plain Turning Lathe.

DRILLING MACHINES

Henry & Wright 3-spdl. HS Sens.
Allen No. 4 Plain, Sensitive.
Woodward & Rogers 4-spdl. Pl. Sens.
Reed 2-spindle Plain Sens.
Henry & Wright 4-spdl. BB Sens.
Blaisdell 36-in. BG, Slid. Hd. Upright.
Superior 24-in. BGPF, Slid. Hd. Upright.
Putnam 25-in. Upright.
Barnes 20-in. Back Geared Upright.
Fosdick 5-ft. Full Univ. Radial.
Dallet No. 4 Portable, Grd. Feed.

SCREW MACHINES

Brown & Sharpe No. 1 Wire Feed.
Foster No. 1 Hand, WF AC Std. Equip.
Brown & Sharpe No. 2 Auto.
Foster No. 2 Hand, WF AC std. Equip.

MILLING MACHINES

Rockford No. 2 Univ. Vert. & Slot. Att.
Pratt & Whitney 12-in. Semi-Auto. Drop Tble.
Brown & Sharpe No. 5 Vertical, Reg. Equip.
Whitney No. 6 Hand, with power feed.
Brown & Sharpe No. 7 Plain, 47-in. table.

LYND-FARQUHAR COMPANY

MACHINE TOOLS OF QUALITY

Dept. "C," Boston 9, Mass.

"BATH" CLEVELAND

Selections From Stock

AUTOMATIC

2¼-in. Model A Cleveland Automatic, with large equipment.

BAR STOCK MACHINES AND TURRET LATHES

1—2-in. P. & W. screw machine for chucking work, power feed.
1—3-in. P. & W. screw machine for chucking work, power feed.
4—Back chasing attachments for No. 4 and No. 6 Warner and Swasey screw machines.
1—No. 3 Foster screw machine, power feed, arranged for bar work.
21-in. Gisholt, late model, taper attachment.
24-in. Gisholt, late model, taper attachment.
24-in. Gisholt, with all latest improvements.

BOLT AND NUT MACHINERY

1—1½-in. National Bolt Cutter—2 spindle, full set of dies.
1—⅝-in. to 2-in. Acme single spindle bolt cutter, full set of dies.
1—1-in. Acme single spindle bolt cutter, style B.

DRILLS

1—No. 2½ Avey 3 spindle drill press.
1—No. 1-SS Garvin duplex drilling machine—never used.
1—28-in. Sibley drill press; new.
1—26-in.-35-in. Cincinnati drill press, 8 speed gear box.
2—12-in. Rockford bench drills.
1—2-spindle 24-in. Barnes all geared drill, pump and piping, and spindle with tapping attachment.
2—26-in. Barnes sliding head drill presses, 70%.
1—26-in. Barnes drill press, with tapping attachment.
2—25-in. Barnes drill presses.
20-in. Drill presses, new and used.

PLANERS

24-in. x 24-in. x 6-ft. Gray planer.
24-in. x 24-in. x 6-ft. J. B. Pease planer.

GRINDERS

1—No. 3 Cincinnati 12 x 48 Universal Grinder.
1—P. O. Point New Yankee drill grinder, capacity ¼-in. to 2½-in., wheel trimming device; new.
1—10 x 50 Norton plain cylindrical grinder.
1—14 x 50 Norton plain cylindrical grinder.
1—18-in. Bryant Internal Grinder, late model, 75%.
1—Bridgeport Grinder, wet or dry—18-in. wheel, 80%.
1—Sterling wet grinder, 12-in. wheel, 80%.
1—12-in. x 36-in. Pratt & Whitney vertical surface grinder.

LATHES

2—16-in. x 8-ft. Bradford quick change gear, engine lathes.
1—19-in. x 10-ft. LeBlond, heavy duty, with turret on shears, 4 way tool post.
1—22-in. x 10-ft. Prentice Bros.—geared head; has 4 jaw independent chuck.
1—20-in x 10-ft. 10-in. Wickes Brothers, new.
1—Lo-Swing lathe, 3½-in. x 60-in.
1—16-in. x 7-ft. Lehman lathe with taper attachment, new.
2—26-in. x 18-ft. Bridgeford engine lathes with taper attachments, geared head, motor driven.

MILLING MACHINES

1—No. 3 Cincinnati Plain Miller.
2—No. 3 Brown & Sharpe plain millers.
2—No. 3-B heavy Brown & Sharpe plain millers.
2—No. 2 Brown & Sharpe vertical millers—cone drive.
1—No. 2 Cincinnati plain miller.
3—Type A Briggs millers, excellent condition.
1—No. 2 Cincinnati universal miller.
1—No. 5 Hendey Lincoln type miller.
1—No. 1 Brown & Sharpe universal miller.
1—Becker No. 7-H Lincoln type miller.
1—No. 2-A Brown & Sharpe universal miller.
2—No. 13 Brown & Sharpe plain millers.
1—No. 2 Knigh. vertical miller.
1—No. 6 Becker vertical miller—rotary table.

GEAR CUTTERS

No. 3—26-in. Brown & Sharpe Plain gear cutter with all parts, 85%.
No. 12 Barber-Colman gear hobber, full set of gears.

PRESSES

2—No. 27 Bliss embossing presses, 2-in. stroke, width of bed 32-in., 1,000 tons approximate capacity, 80%.
1—No. 59 Toledo crank press, double back geared, 12-in. or 18-in. stroke, friction clutch, 80%.
1—No. 60½ Bliss rack and pinion drawing press, 80%.

SAWS

1—2-in. Hurlburt cutting off machine.
1—11½-in. Higley cut-off saw, 14-in. blade, 70%.
1—6-in. Clem tilting band saw.

SHAPERS

1—20-in. Gould & Eberhardt shaper.
1—24-in. Gould & Eberhardt shaper.

SLOTTERS

1—15-in. Dill slotter, with countershaft, toolholders and all regular equipment.
1—16-in. Betts slotter with countershaft, toolholders and all regular equipment.

MISCELLANEOUS

1—20-in. Rochester gear tooth rounding machine.
1—Small American Oil Separator.
1—6-ton Morgan steam forging hammer, 84-in. stroke, 26-in. cylinder, 8-in. rod, double frame, 90% condition, weight 300,000 lb., approximately.
1—18-in. Crankshaft for Bliss No. 77½ press.
1—15-ton Lucas Forcing press.
1—No. 3 Mitts & Merrill Keyseater.
1—No. 4 Baker Bros. Keyseater.
1—No. 5 Canton Alligator shear, low knife, 26-in. blade.

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Milling Machines? Yes, Sir!

HERE'S WHAT WE'VE GOT

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Oesterlein Machine Co., of Cincinnati, Ohio

They're all *Cone Driven* and *Back Geared*

2—No. 20 "OHIO" PLAIN. Feeds, 20 in. x 7½ in. x 18 in.
1—No. 24 "OHIO" UNIVERSAL. Feeds, 24 in. x 10 in. x 17 in.
1—No. 2 "OHIO" UNIVERSAL. Feeds, 28 in. x 10 in. x 17 in.
2—No. 3 "OHIO" Heavy PLAIN. Feeds, 34 in. x 12 in. x 20 in.
1—No. 3 "OHIO" Heavy UNIVERSAL. Feeds, 34 in. x 12 in. x 19 in.
1—No. 4 "OHIO" UNIVERSAL. Feeds, 42 in. x 12 in. x 19 in.

They are all NEW—in stock at Boston—and you can't make a milling machine any better.

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AT LOW PRICES—SPECIAL OPPORTUNITY

38—ALLEN 3, 4, 5 and 6-Spindle High-Speed Ball Bearing DRILL PRESSES, very latest types, like new.
65—BECKER No. 7-H Lincoln Type Plain MILLING MACHINES, very latest types, and very little used.

PRODUCTION MILLERS

3—42-in. BRIGGS Type "B," all NEW.
2—16-in. BRIGGS Type "A," like new.
8—18-in. CINCINNATI Automatic Plain, very latest, like new.
2—No. 5 HENDEY Lincoln Type, latest.

MILLING MACHINES

1—No. 3 BECKER Vertical, rotary table.
1—No. 2 KEMPSMITH Plain, like new.
5—18-in. B. G. CINCINNATI Plain, latest.
1—No. 6 WHITNEY Hand, some NEW.
1—No. 22 GARVIN Vertical, rotary table.
1—No. 2½ ROCKFORD Plain, s.p.d., very latest.
1—No. 2 ROCKFORD Plain, d.b.g., latest.

HEAVY LATHES

1—27-in. x 16-ft. REED-PRENTICE Geared Head, single pulley drive, latest type.
2—36-in. x 14-ft. PUTNAM, triple geared with taper attachment, latest type.
1—24-in. x 8-ft. LODGE & SHIPLEY, Q.C.G. Taper attachment.

SHAPERS, ETC.

1—21-in. SMITH & MILLS B.G., latest.
1—No. 12 MODERN Plain, cylindrical.
1—OHIO 20-in. B.G. heavy duty, latest.

HIGH-SPEED DRILL PRESSES

2—6-spindle HENRY & WRIGHT, like new.
1—5-spindle HENRY & WRIGHT, same.
2—4-spindle HENRY & WRIGHT heavy tables.
3—3-spindle HENRY & WRIGHT, like new.
3—6-spindle ALLEN, adjustable table.
1—3-spindle ALLEN, same, like new.
1—40-in. New Haven B.G. Sliding Head.
1—Sipp 1-spindle, ball bearing, latest type.

SCREW MACHINES

5—No. 4 FOSTER Geared Friction Head, with power feed to turret on four, very latest types, 1 5/16-in. capacity.
1—No. 3 FOSTER Hand, plain, latest type, 1 5/16-in. capacity.
1—No. 3-A WARNER & SWASEY Hollow Hex. Universal Turret Lathes, like new, very latest type.
3—NO. 6 WARNER & SWASEY Geared, head friction, latest type, p.f. to t.
3—2½-in. GRIDLEY 1-spindle Automatics.

POWER PRESSES

1—No. 7 Z. & H. straight side Geared, latest, 4-in. stroke.
2—No. 4 Z. & H. Inclinable, very latest.
8—No. 18 EXCELSIOR Inclinable, same as 18 Bliss, weight 750 lbs., 1½-in. stroke, all New, guaranteed.

LATHES

1—18-in. x 8-ft. REED-PRENTICE Geared Head with taper attach.
1—16-in. x 8-ft. GREAVES-KLUSMAN, Q.C.F., D.B.G. 3-step cone.
1—16-in. x 8-ft. SEBASTIAN, 24-in. gap.
3—HAMILTON 20-in. x 10-ft., very latest type, 3-step cone, D.B.G.
2—20-in. x 10-ft. REED, with taper attach., swings full 22-in., latest.
4—16-in. x 10-ft. WHITCOMB, with taper attach., swings 18-in., latest.
1—18-in. x 10-ft. LEHMAN, Q.C.G., tapered, very latest, D.B.G., 3-step.
1—16-in. x 8-ft. REED, latest.
1—13-in. x 5-ft. Seneca Falls, latest type, motor driven, with motor.

HEAVY KEYSEATER

1—No. 3½ BAKER BROS., very latest type, complete, cuts keyways 24 x 4-in., weight about 10,000 lbs., new.

MISCELLANEOUS

1—PLANER—Whitcomb, 24-in. x 6 ft., latest type.
2—FOX MONITOR LATHES—American, like new, 18-in. x 6-ft.
1—SLOTTER—Wm. Pilton, latest.
2—No. 12 PROFILERS—L-G. 2-sp.

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New MACHINE TOOLS Used
READY TO SHIP

AUTOMATICS

2—No. 2 Brown & Sharpe.
2—No. 2G Brown & Sharpe.
2—⅝-1½-in. Cleveland Model "A."
5—⅝-1½-in. Cleveland Model "B."
1—2½-2½-in. Cleveland Model "A."
4—2½-2¾-in. Cleveland Model "A."
1—3½-3½-in. Cleveland Model "A."
2—3¼-in. Gridley, Single Spindle.
1—No. 53 National Acme Multiple Spindle.
5—No. 55 National Acme Multiple Spindle.
6—No. 56 National Acme Multiple Spindle.
1—Acme Screw Slotter.

TURRET LATHES AND HAND SCREW MACHINES

5—No. 11 S.P. Garvin Plain Head, Bar Capacity, 1⅛-in.
10—No. 2 (NEW) Bardons & Oliver Plain Head, Power Feed to Turret, Bar Capacity 1-in.
9—No. 2 Biggs Plain Head, Bar Capacity, 1 in.
1—No. 6 Biggs Friction Back Gear, Power Feed to Turret, Bar Capacity 2 in.
36—No. 3 Stecker Superior Plain Head, Bar Capacity, 1 5/16 in.
2—No. 1 Warner & Swasey Plain Head, Bar Capacity ⅞ in. (NEW).
3—No. 4 Warner & Swasey Geared Friction Head, Power Feed to Turret, Overhead Chasing Attachment, Bar Capacity 1½ in. (NEW).
1—No. 4 Warner & Swasey Geared Friction Head Hand Feed, Bar Capacity 1½-in. (NEW).

LATHES

1—10-in. x 42-in. Barnes, Belt Power and Foot Power.
1—12-in. x 5-ft. Worcester, Taper Attachment.
1—12-in. x 5-ft. Davis.
1—14-in. x 6-ft. Earl (NEW)
1—14-in. x 6-ft. Flather.
1—14-in. x 6-ft. Fitchburg.
1—16-in. x 6-ft. R.K. LeBlond.

MILLING MACHINES

1—No. 3 Van Norman Duplex Milling Machine.
1—No. 2½ Rockford High Power, Plain. (NEW).
2—Briggs, Type "A", 16-in. Traverse.
1—No. 6—62-in. Becker, Vertical (NEW).
1—No. 0 B. & S. Plain.
21—No. 0 Burke, Bench.
3—Carter-Hakes, Bench.
14—No. 3 Burke.
10—No. 1 Toledo (Kent-Owens).
11—Wisconsin.

SHAPERS AND PLANERS

1—16-in. Cincinnati Back Gear Crank (NEW).
1—24-in. Cincinnati Back Gear Crank (NEW).
2—24-in. x 24-in. x 6-ft. Powell, one head (NEW).
1—36-in. x 36-in. x 10-ft. Two Heads on Rail. (New.)
1—48-in. x 48-in. x 12-ft. Patch, four heads.

GRINDERS

1—No. 2 Brown & Sharpe, Surface.
1—No. 1 Grand Rapids Tool and Cutter.
1—No. 120 Gardner Disc.
1—No. 75 Heald Internal.
2—14 x 36 Bridgeport Cyl.
2—Gisholt Tool.

DRILLS

1—20-in. Champion Back Gear, Power Feed.
2—No. ½ Avey H. S. Bench, ⅝-in. capacity.
75—Sigourney Sensitive, ⅝-in. capacity.
90—Pilton Sensitive, ⅝-in. capacity.
1—No. 0 Burke, Bench.
5—No. 1 Langelier Sensitive, 7/32-in. capacity.
2—Allen Pedestal, ⅝-in. capacity.
1—Demco 2-spindle Pedestal, ⅝-in. capacity.
2—Leland-Gifford 2-spindle Pedestal, ⅝-in. capacity.

MISCELLANEOUS

1—No. 20 "Quickwork" Rotary Shear 30-in. Throat.
1—Gen. Elec. Centrifugal Blower, Capacity 750 cu. ft. per minute.
15—Modern Die Heads, Nos. 1 and 5.
4—Harvey-Hubbell Tapping Machines, Cap. 1½-in.
3—Jaw Geared Scroll Chucks, all sizes, 4-in. to 12-in.
4—Jaw Independent Chucks, all sizes, 5-in. to 20-in.

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NEW MACHINE TOOLS—*IMMEDIATE DELIVERY*

DRILLS

1—Taylor & Fenn, No. 1, Type D, Bench Drill.
1—Taylor & Fenn, No. 3, Type A, Drill Press, three spindle.
1—Weigel 21-in. Sliding Head Drill, belt driven.

LATHES

1—Amtew 14 in. x 6 ft. Lathe, 3 step, double back gear.
1—Hamilton 20 in. x 10 ft. Style B Lathe, 3 step, double back gear.
1—Hamilton 20 in. x 12 ft. Style B Lathe, 4 step, single back gear.
2—Sundstrand 9 in. x 12 in. Geared Head Manufacturing Lathes.
1—Sundstrand 16 in. x 6 ft. Cone Head High Power Manufacturing Lathe.

MILLING MACHINES

3—Taylor & Fenn Vertical Milling Machines.

SAWS

2—Racine No. 1 Hack Saws.
2—Peerless 6 in. x 6 in. Hack Saws.

GRINDERS

1—Norton No. 2 Universal Tool and Cutter Grinder.
1—Gardner No. 4 Disc Grinder.
1—Gardner No. 14 Disc Grinder.
1—Ott 10 in. x 32 in. Universal Grinder.
1—Taylor & Fenn Bore Grinder.
1—Sterling Universal Tool and Cutter Grinder.
2—Taylor & Fenn 20-in. Wet Tool Grinders.
2—Gardner No. 3 Polishing Lathes.
1—Gardner No. 2 Disc Grinder.

HAMMER

1—Beaudry No. 7, 200 lb. Champion Type, belt driven.

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LATHES

24-in./48-in. x 14-ft., Rahn-Larmon Extension, new.
42-in. Pond Car Wheel Lathe, motor drive.
42-in. x 18-ft. Niles, blocked to 50-in.
36-in. x 22-ft. Bridgeford, G.H., motor drive.
36-in. x 16-ft. New Haven, Q.C.
36-in. x 16-ft. Sidney, D.B.G., Q.C., new.
32-in. x 16-ft. Sidney, D.B.G., Q.C., new.
27-in. x 14-ft. Sidney, D.B.G., Q.C., new.
26-in. x 24-ft. New Haven, C.R.
24-in. x 12-ft. Lodge & Shipley, Q.C.
21-in. x 8-ft.-10-ft.-12-ft. Sidney, D.B.G., Q.C., new.
20-in. x 8-ft. Fitchburg, S.S., P.R.
20-in. x 8-ft. Bridgeport, P.R.
20-in. x 8-ft.-10-ft.-12-ft. Sidney, D.B.G., Q.C., new.
19-in. x 24-ft. Rahn-Larmon, D.B.G., Q.C., new.
19-in. x 14-ft. Fitchburg, P.R.
19-in. x 8-ft.-10-ft.-12-ft. Sidney, D.B.G., Q.C., new.
18-in. x 8-ft.-10-ft. Sidney, D.B.G., Q.C., new.
18-in. x 8-ft.-10-ft. A. V. Carroll, D.B.G., Q.C., new.
18-in. x 8-ft. Flather, C.R.
18-in. x 8-ft. Schumaker-Boye.
17-in. x 8-ft. Flather, P.R.
17-in. x 6-ft.-8-ft.-10-ft. Sidney, D.B.G., Q.C., new.
16-in. x 6-ft. LeBlond, T.A., P.C.
16-in. x 8-ft.-10-ft.-12-ft. D.B.G., Q.C., Sidney, new.
15-in. x 5-ft. Putnam.
15-in. x 6-ft.-8-ft.-10-ft. Sidney, D.B.G., Q.C., new.
15-in. x 6-ft.-8-ft. Carroll-Jamieson, new.
13-in. x 5-ft. 6-in., 7-ft. 6-in. Carroll-Jamieson, new.
13-in. x 6-ft. Reed, P.C.
13-in. x 5-ft. 6-in. Carroll-Jamieson, C.R., new.
11-in. x 5-ft. Meyers, C.R.

HOR. BORING MILL

3-in. bar Barnes.

TURRET LATHES

21-in. Gisholt.
24-in. Gisholt.
No. 1 and No. 5 Bardons & Oliver.

PLANERS

40-in. x 40-in. x 10-ft. Powell, 2-H.
36-in. x 36-in. x 8-ft. Gray, 2-H.
26-in. x 28-in. x 8-ft. Pond, 1-H.
24-in. x 24-in. x 6-ft. Pond, 1-H.
24-in. x 24-in. x 6-ft. Harrington, 1-H.
18-in. x 18-in. x 4-ft. Pond, 1-H.
18-in. x 18-in. x 3-ft. Wheeler, 1-H.
16-in. x 16-in. x 3-ft. Walter, 1-H.

SHAPERS

26-in. Morton Draw Cut.
24-in. Steptoe, B.G., new.
20-in. Steptoe, B.G., new.
16-in. Steptoe, B. G., new.
16-in. Smith & Mills.
14-in. Steptoe, new.
10-in. Bement Traveling Head.

SLOTTERS

18-in. Newton, motor drive.
16-in. Betts, belt drive.
10-in. Stevens, belt drive.
10-in., 12-in. Dill, belt drive.

MILLERS

No. 4 Brown & Sharpe, plain.
No. 24 Osterlein, plain.
No. 22 Garvin, Vertical.
No. 2 Garvin, Universal, new.
No. 2A Garvin, Universal, new.
No. 1 Dow, plain, new.
No. 3½ Fox, plain.
No. 3 Burke, plain, new.

GRINDERS

No. 1 Grand Rapids, Universal.
No. 1 Manhattan, Surface.

PRESSES AND SHEARS

350 ton Boomer & Boschert Hydraulic.
35 ton Bethlehem, 8-in. throat, 40-in. wheel.
No. 121 Max Ams Inclinable.
4—Power Screw Presses, 3-in. screw.
No. 10 Excelsior Foot Press.
No. 41 Beloit Splitting Shear.
No. 46½ and No. 47 Beloit Alligator Shears.
No. 52, 53, 54 Beloit combined Punch and Shear.

DRILL PRESSES

16-in. Canedy-Otto, plain.
20-in. Superior.
20-in. Canedy-Otto, plain.
20-in. Champion.
20-in. Buffalo.
21-in. Superior.
21-in. Superior, sta. Bronze Bushed, hi-speed.
24-in. Superior, sta.
24-in. Barnes, S.H.
25-in. Superior, S.H.
25-in. Buffalo, sta.
28-in. Snyder, S.H.
30-in. Box Radial.
32-in. Pond, S.H.
42-in. Canedy-Otto, plain Radial, floor type.
42-in. Canedy-Otto, plain Radial, post type.
6-ft. Western, Full Universal.
8 spindle, Bausch Multiple.
3 spindle, Barnes.
1—6 spindle, Allen.

PIPE MACHINES

2-in., 4-in., 6-in. Oster, new.

HAMMERS

25, 50, 100 lb. Little Giant Power.
1500-lb. Single Leg Niles Steam Forg.
1000-lb. Double Frame Niles Forging.
800-lb. Double Frame Niles Forging.
750-lb. Chambersburg Double Frame Forg.

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OUR GUARANTEE—Money Back If Not Satisfied

DRILLS, RADIALS

1—5-ft. Universal Radial Drill.
1—4-ft. Universal Radial Drill, arranged motor drive.
2—25-in. Weigle Drills, S.H.B.G., P.F.
4—Hoefer Drills, 21, 24, 26, 28-in.

GRINDERS

1—10 x 36-in. Thompson Full Universal
1—No. 2 Manhattan Surface Grinder; new.
1—Grand Rapids Drill Grinder, ⅛ to 2½-in. cap.
1—No. 2 Oakley Universal Cutter and Tool Grinder.
1—Greenfield Universal Cutter and Tool Grinder.
1—Wells Cutter and Tool Grinder.
1—No. Ja Yankee Drill Grinder.
1—No. 60 Heald Internal Cyl. Grinder.

SHAPERS

2—16-in. Streine B. G. Shapers; new.
3—16-in. Whipp S. G. Crank Shapers; new.
2—20-in. Ohio B. G. Crank Shapers; new.
1—Each 16, 18, 21, 24-in. Hollingsworth B. G. Crank Shapers; new.

MILLERS

1—No. 2 American Plain Mill; used.
1—Each Nos. 2-B and 2 Rockford Universal Mills; new.
1—No. 0 Bickett Vertical Mill and Profiler; new.
2—No. 1 U. S. Hand Millers.
10—No. 25 Becker Plain Millers.
12—No. 32 Kempsmith Lincoln type Millers

PRESSES AND PUNCHES

3—No. 2 Pratt & Whitney Trimming Presses. Willard Presses 2, 3, 4, 5-A Inc.
1—No. 5 Badger Hand Power Punch and Shear.
1—62-in. Badger Combined Stake Riveter and Punch; Dia. of stake 14-in.; riveting cap. ⅝-in.; punching cap. ⅝-in. x ½-in.; good as new.
1—Doty Combined Punch and Shear—Geared; Cap. about ¾ x ¾-in.; with 7-in. throat.

GISHOLT TURRET LATHES

20—24-in. Gisholt Turret Lathes with 2½-in., 4¼-in. and 6¼-in. hollow spindles; chucking equipment, quick return, rapid traverse.

STEINLE TURRET LATHE

1—24-in. Steinle Turret Lathe, full swing side carriage, 4¼-in. hollow spindle, geared head, with single pulley drive, arranged for motor or C-S drive.

HAND SCREW MACHINES

15—No. 2 Smith Hand Screw Machines, round collet, capacity 1⅛-in., wire feed and auto. chuck, independent stops to turret.

BAUSH DRILLS

1—Baush Multiple Spindle Drill, arranged for 24 spindles, now with 12 spindles; takes 60-in. between columns, drills in any circle 12-48-in. diam.; approximate weight 30,000 lb.
1—No. 1 Baush High Speed Multiple Spindle Drill, rectangular head 16 x 20-in., arranged for 16 spindles; now with 10-1¼-in. spindles, No. 2 M. T.; cone drive.
1—No. 1 Baush High Speed Multiple Spindle Drill, equipped with round head 13½-in., with 8-1¼-in. spindles, No. 2 M.T.; cone drive.

BENDING ROLL

1—10-ft. Bertsch Pyramid Type Bending Roll, capacity ½-in. plate, drop end housing, 9-in. rolls.

LATHES

1—25-in. x 8-ft. Economy Heavy Duty Single Purpose Lathe, D.B.G. 3-step cone, C.R., Hol. sp., quick change feed.
1—Each Sidney Medium Pattern Lathes, 14, 16, 18, 20-in. by 6, 8, 10-ft. beds; D.B.G. 3-step cone Q.C.G.
1—Each Sidney Heavy Duty Lathes, 15, 17, 19, 25, 27-in. by 6, 8, 10, 12, 14-ft. beds; D.B.G. 3-step cone.
1—16-in. x 8-ft. Gray Engine Lathe, screw cutting, S.B.G. cone.
1—14-in. x 6-ft. Flather Engine Lathe, screw cutting, S.B.G. cone.
2—12 x 14-in. x 6-ft. Worcester Tool Room Lathes, taper attachment, pan and collet.
2—Used 18-in. x 10-ft. Hamilton Lathes, complete, C.R., H.S., quick change and semi-quick change gears, countershaft, tail stock, power feed turret.
1—32-in. x 16-in. Ohl Engine Lathe; with 4-in. raising blocks to swing 40-in., D.B.G., 5-step cone, 4-in. belt C.R.
1—20-in. x 12-ft. Engine Lathe, C.R. H.S., with Hex turret on ways.
1—20-in. x 10-ft. Lodge & Davis C.R. H.S.
1—17-in. x 8-ft. Cincinnati—not screw cutting H.S., plain rest.
1—16-in. x 6-ft. Lodge & Davis—solid spindle, plain rest.

PLANERS

1—24 x 24 x 6 Gray Planer, single head.
1—26 x 24 x 8 Pond Planer, two heads.
1—40x40x10-ft. New Haven single head.

MISCELLANEOUS

1—No. 6 Quickwork Rotary Shear, 48-in. th. 1-in. cap.
1—26-in. B. & S. No. 3 Gear Cutter.
1—40-lb. Bradley Cushion Helve Hammer.
1—250-lb. Little Giant Power Hammer.
1—Crank Drop Hammer, about 500-lb. cap.
2—5-ton 40-ft. span, 3-motor, 3-phase, 60-cycle, 220-volt, traveling cranes.
1—50-in. Sellers Car Wheel Borer and Facer.

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15-in. x 7-ft. P. & W. speed lathe.
18-in. x 8-ft. LeBlond, quick change.
21-in. x 8-ft. LeBlond, geared head, heavy duty.
22-in. x 8-ft. Niles, c.r.
24-in. x 10-ft. Whitcomb, q.c.
26-in. x 26-ft. Niles, c.r.
28-in. x 18-ft. Niles, c.r.
28-in. x 30-ft. Niles, c.r.
42-in. x 20-ft. Niles, c.r.
48-in. x 30-ft. Niles, c.r.

TURRET LATHES

2-in. x 24-in. J. & L. cone head.
2-in. x 26-in. P. & W. turret lathe.
28-in. size J. Gisholt 3¼-in. spindle.
24-in. size I Gisholt, 220-volt, motor drive, d.c.
28-in. Milwaukee rigid, 4¼-in. spindle.
34-in. size K Gisholt, 4½-in. spindle.

MILLERS AND GEAR CUTTERS

No. 3 Brown & Sharpe universal, old style.
No. 3 36-in. x 8-in. Brown & Sharpe Gear Cutter.
No. 4 36-in. x 9-in. Brown & Sharpe Gear Cutter.
No. 6 60-in. x 12-in. Brown & Sharpe Gear Cutter.
15-in. Gleason Bevel Gear Generator.

SHAPERS AND PLANERS

18-in. Walcott Rack.
20-in. Gould & Eberhardt.
30-in. x 30-in. x 6-ft. Pond, 2 heads.
30-in. x 30-in. x 10-ft. Pond, 2 heads.
30-in. x 30-in. x 12-ft. Pond, 2 heads, 220-volts, D.C., Reversing Motor Drive.
38-in. x 38-in. x 12-ft. Niles, 4 heads.
38-in. x 38-in. x 16-ft. Niles, 3 heads.
44-in. x 44-in. x 20-ft. Niles, 4 heads.
48-in. x 48-in. x 10-ft. Niles, 4 heads.
60-in. x 60-in. x 20-ft. Niles, 3 heads.

DRILLING MACHINES

60-in. Niles, heavy vertical.
3-ft. Grant Radial Drill and Boring Machine.
5-ft. Niles, full universal, 220-volt Motor, D.C.
6-ft. Niles, full universal, 220-volt Motor, D.C.
4-ft. Prentice Speed Box Radial.
5-ft. Niles Semi-Universal, old style.
6-ft. Niles, Semi-Universal, old style.

GRINDERS

4-in. x 30-in. No. 11 Brown & Sharpe pl.
12-in. x 66-in. No. 4 Landis Universal.
39-in. Grindstone Frame Brown & Sharpe.

BORING MACHINES

No. 1 Bement Horizontal, 2⅞-in. spindle, 5-ft. table.
No. 2 Bement Horizontal, 3⅞-in. spindle, 6-ft. table.
No. 3 Bement Horizontal, 4⅝-in. spindle, 9-ft. table.
6-in. spindle, Bement Floor, Boring and Drilling Machine.
42-in. Niles Boring and Turning Mill.
60-in. Bement Boring and Turning Mill.

MISCELLANEOUS

Air Compressor, type 10, Ingersoll-Rand, steam driven, capacity 535-ft.
Air Compressor, Ingersoll-Rand Duplex, motor driven, with 35-hp., d.c. motor, capacity 215-ft.
Blower, No. 10 Sturtevant.
Blower, No. 70 Buffalo.
Crane, 20-ton, 48 span Sellers 220 Motor, D.C.
Engine, 164-hp. McEwen, direct connected to 100 kw. generator, d.c., 220-volt.
Profiler, No. 3 Automatic, Keller.
Saw No. 7 Cold Cut.
Saw, 8-in. rounds, Higley.
Slotter, 6-in. Bement.

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12—3-Ton Pedrick & Ayer Pneumatic Wall Jib Cranes with 16-ft. Arm, 14-ft. travel and a 4-wheel saddle type traveller.

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4—16-ft. Cleveland Punch & Shear Wall Radials including motors.
1—Two-spindle Dallet Horizontal Boiler Drill power feed, distance between housings 15-ft. 6-in., horizontal travel 14-ft. vertical travel 7-ft., including motors.

HYDRAULIC MACHINES

2—75-ton Morgan Hydraulic Flanging Presses.
1—100-ton Morgan Bull Riveter, 10-ft. Gap, with accumulator, Pump, hydraulic crane and motor.

PLATE PLANERS

1—No. 3 Hilles & Jones Plate Planer, 20-ft. between housings, belt driven.
1—Niles Plate Planer, 24-ft. between housings, driven.

PUNCHES AND SHEARS

1—No. X Cleveland Punch & Shear, manhole punch, throat capacity 24 x 30-in. oval thru ¾-in., including motor.
1—No. 4 Hilles & Jones Single End Punch, 42-in. throat, belt drive.
1—Single End Punch, 36-in. throat, capacity 1¼-in. x 1¼-in., belt drive.
4—Single End Punches, 36-in. throat, capacity 1¼ x 1¼-in., including motors.
1—Double End Punch, 30-in. throat, capacity 1-in. x ½ and 1-in. x ¾, belt driven.
1—Horizontal Punch 12-in. throat, belt driven
1—No. 2 Hilles & Jones Horizontal Punch, 8-in. throat including motor.
1—Knight Plate Shear with 30-in. throat, belt driven.
1—Slitting Shear, 40-in. throat, capacity 1⅛-in., belt driven.
1—Single End Shear, 40-in. throat, including motor.
1—Plate Bevelling Shear, 12-in. throat, belt driven.
1—No. 2 Hilles & Jones Double Angle Shear, capacity 6 x 6 x ⅝ angles including motor.
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1—Set of Straightening Rolls, length between housings 60-in., including motor.
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10—Briggs Millers, each 350
5—No. 36 Chicago Hand Millers, each 125
12—No. 26 Becker Large Hand Millers, each 150
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42 in. x 42 in. x 12 ft. 6 in. Newton Slab Milling Mach.

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HORIZONTAL—VERTICAL BORING MILLS

2—5 in. bar Dietrick & Harvey Floor Type Boring, Milling and Drilling
4 in. bar Newton Floor Type Boring, Milling and Drilling, motor driven, one 5½ and 7½ H.P. Crocker-Wheeler D.C. motors
30 in. Bullard Vertical Mill, round head
30 in. Bullard, hexagon head
36 in. Bullard Rapid Production Mill, with side head.

LATHES SCREW MACHINES

3—36 in. x 16 ft. Niles-Bement-Pond, motor driven quick change, geared head
24 in. x 18 ft. Johnson, geared head, c.r., h.s.
21 in. x 10 ft. New Haven, c.r., p.c.f., h.s.
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16 in. x 8 ft. Hendey, quick change rear, taper attachment.
18 in. x 6 ft. Lodge & Davis, h.s., p.c.f.
18 in. x 8 ft. Rahn Larmon, double back geared, quick change, etc. NEW
16-in. x 8-ft. LeBlond, h.s., c.r., p.c.f.
2—14-in. x 6-ft. Rockford, quick change gear, double back geared.
14 in. x 6 ft. Fay & Scott, h.s., c.r., p.c.f., etc.
14 in. x 8 ft. Prentice, quick change gear, c.r., p.c.f.
14 in. x 6 ft. Blaisdell, h.s., c.r., p.c.f.
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12 in. x 5 ft. Master, geared head, c.r., p.c.f., h.s.
2—No. 608 Rivett Precision
1½ in. Garvin Turret Screw Machine
No. 3 Superior Turret Lathes
2 x 24-in. Jones & Lamson Flat Turret Lathe
3—No. 6A Potter & Johnston Automatic Chucking Machines, bar equipment, motor driven
20 in. Swing Libby Turret Lathe, 1 15/16 in. hollow spindle
NATIONAL ACMES, 2—No. 52, 4—No. 53, 2—No. 54, 10—... o. 56.
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Biggs Screw Machines—1-in. capacity, through wire feed.

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No. 25 and No. 26 Beckers
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21 in. Garvin Plain
No. 2 Woods Universal Cutter and Reamer Grinder
12 in. x 36 in. Queen City Plain Cylindrical
12 in. x 48 in. Modern, self contained type
No. 1 Bath Universal Grinder.

DRILLS—SHAPERS

6 spindle Allen High Speed, cap. ¾ in.
4 spindel Rockford Drills.
3 spindle Rockford Drills.
20-in. Snyder, 20-in. Rockford Drill Presses.
24 in. Cincinnati Shaper
24 in. Hendey, back geared crank
24 in. Gould & Eberhardt, back geared crank
24 in. American, back geared crank
16 in. Potter & Johnston Plain, universal knee

PRESSES—PUNCH-SHEARS

3—No. 4 Atlas Arbor, diameter of work 21 in.
6—No. 28 Atlas Arbor, diameter of work 38 in.
16—No. 26 Atlas Arbor, diameter of work 30 in.
1—No. 3 Zeh & Hahnemann Press
Carlin Alligator Shear, capacity 2 in.

MISCELLANEOUS

24 in. x 24 in. x 10 ft. Woodward & Powell Planer, single head
6 in. Sellers Slotter, rotary table
No. 11 Pratt & Whitney Profiler, 2 spindles
350-lb. Merrill Board Lift Auto Drop Hammer.

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38 x 14 American Tool Works, Trip Grd.
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33 x 20 Putnam.
32 x 10 Gleason.
30 x 14 Fitchburg.
30 x 12 Niles.
27 x 10 Lodge & Davis.
26 x 12 Canada Corp. Q. C.
24 x 21 Fitchburg with taper.
24 x 12 Fitchburg.
24 x 10 Whitcomb Blaisdell Q. C.
22 x 18 Fitchburg with taper.
20 x 20 Putnam.
20 x 10 Canada Corp. Q. C.
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18 x 8 Cincinnati.
18 x 8 Milwaukee.
18 x 8 Sidney.
18 x 6 Rahn Larmon.
18 x 6 Fay & Scott.
16 x 6 Pond.
48-in. Niles double head car wheel lathe, 2 carriages.

Pulley Lathes

26-in. Davis Furber.
40-in. Pond.
50-in. Niles.
All with front and back carriages and two tool slides.

Turret Lathes Bar and Chucking

2—24-in. Steinle with turret tool post on carriage and hex turret on bed, rapid traverse.
10—24-in. Gisholt, Same.
2—28-in. Pond, Same.
2—24-in. W. P. Davis.
3-in. x 36-in. Jones & Lamson.
14-in. Canada 3 hole set over turret (10 machines).
18-in. Milwaukee, turret on bed. (10 machines).

Drill Presses and Boring Machines

8 spindle Baush Universally adjustable 20-in. circular head, capacity, 1 in.
4 spindle Foote Burte straight line adjustable, capacity 1 in.
5 foot Warren radial plain.
4 foot Western full Universal.
6 spindle slate sensitive automatic cam feed.
Binsse horizontal 3-in. bar.
Foote Burte 2 spindle adjustable vertical.

Planers, Shapers and Slotters

24 x 24 x 5 Gray.
26 x 26 x 6 Niles.
30 x 30 x 6 Woodward & Powell.
38 x 38 x 12 Niles—2 heads.
12-in. Niles crank.
15-in. Pratt Whitney crank.
8-in. Niles Traverse head 2 tables.
20-in. Pedrick & Ayer 2 tables.
24-in. Hendey.
12-in. Putnam rotary table slotter.
18-in. Betts rotary table slotter.
18-in. Niles rotary table slotter.
20-in. Niles rotary table slotter.

Milling Machines

Niles vertical 48-in. swing, compound table and rotary.
Newton vertical 33-in. swing, compound table and rotary.
Ingersoll planer bed type double housing with adjustable rail. 2 vertical heads 36 x 36 x 10.
No. 22 Garvin vertical.
No. 5 Becker vertical.
Pedrick & Ayer Universal 36-in. table feed.
Pratt & Whitney No. 2 hand.
Hendey Lincoln millers 20-in. automatic feed (25 machines).

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Lees Bradner 6-in. x 8-ft. Thread miller (long bed type) for lead screws, spirals and worms.
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Morton 18-in. stroke for 1½-in. wide.
Morton 24-in. stroke for 2½-in. wide.
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9-in. x 15-in. Ford Smith plain.
20-in. x 72-in. Landis Universal.
Cincinnati Universal tool.

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80 lb. L. & A. (Bradley type) helve.
1,000 lb. Lennox friction board drop.
1,250 lb. Massillon steam drop.
6-ft. New Doty, capacity 1-in. plate.
8-ft. Lennox, capacity ½-in. plate.
20-in. throat Queen City single end punch, capacity ⅝-in. through ¾-in.
Wiener T 40 shear for 15-in. I beams 4-in. x ⅝-in. angles. Wt. 20,000 lbs.
No. 55 D.G.G. Ferracute straight sided (2).
No. 56 D.G.G. Ferracute straight sided.
No. 27 Bliss knuckle joint.
No. 39 Bliss wiring and horning.
Hydraulic presses, accumulators and pumps.

Miscellaneous

2½-in., 4-in., 6-in., 12-in. Curtis pipe threaders.
4-in. Bignall & Keeler pipe machine.
⅝-in. Adams 2 spindle bolt cutter.
1-in. Acme 4 spindle bolt cutter.
2-in. Acme 2 spindle bolt cutter.
2½-in. Acme 2 spindle bolt cutter.
No. 50 and 60 Waterbury thread rollers.
Acme 4 spindle 1½-in. vertical nut tapper.
2½-in., 3-in., 4-in., 6-in. pipe and shafting cutting off machines.
6-in. Newton cold metal saw.
Nut facing machines.

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10-ft. Bement Vertical, 2 heads.
72-in. Cincinnati Vertical, 2 heads.
38-in. McCabe Vertical, 1 head.
No. 35 Landis Horizontal, 3½-in. bar, floor type.
No. 3 Barrett Cylinder, 6-in. bar, floor type, 2 heads.

RADIAL DRILLS

3—3-ft. Morris Plain with tapping attachment gear box, single pulley drive.
1—3-ft. Ditto cone drive.
3—5-ft. Mueller Prentiss, Bausch plain with tapping attachment.
1—5-ft. Cincinnati Bickford Universal.
1—Weiner Portable Radial Drill.
No. 3-H LeBlond Universal Miller.
No. 3 Landis Universal Grinder.
25-in. Silver Back geared drill.

COMPLETELY EQUIPPED BOILER SHOP

10-ft. Bending rolls drop end housings.
42-in. throat Bertsch Punch.
¾-in Lennox Rotary Shear.
W.H., 3 Sullivan, 12 x 7-in. x 10-in., Duplex Air Compressor.
Davis Bournonville Welding Outfit.
80—Pneumatic rivet, chipping and calking hammers.
1¼-in. Cone standard, 4 spindle automatic with die head fully equipped for making ferrules.
10-ft. Double face, facing lathe, built by Lincoln Iron Works, independent faces for motor drive, star feed of heads.
40 Cycle Motors, 3 to 54 hp., 3 phase, 220 volt.

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3-ton Ladle Sand Mixer, belt driven, power riddle, etc.
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Miscellaneous items such as chain hoists, trolleys, vises, anvils, oil furnaces, No. 1 American oil separator, Hauck oil burners, belting, drill chucks, reamers, drills, taps, collets, files, clamps, lathe holders and tools, emery wheels, punches, dies, steel cable and chains, etc. Portable and suspension scales, derricks and jacks, etc.

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BORING MILLS

2—NEW—36-in. Bullard New Era Type Vertical Boring Mill, complete with four jaw chuck, 10-15 hp., 230 volt motors, 1100 r.p.m., lubricant system.
1—72-in. Cincinnati Vertical Boring Mill, two swivel heads.
1—Beaman-Smith Horizontal Boring Mill, 3-in. bar.

LATHES

1—84 in. x 30 ft. Niles-Bement-Pond High Duty Lathe.
1—60 in. x 30 ft. Niles-Bement-Pond High Duty Lathe.
1—64 x 51 ft. Detrick & Harvey Lathe, all geared head, arranged for motor drive.
2—48 x 54 Bridgeford Lathes, all geared head, arranged for motor drive.
10—48 x 56 ft. Niles-Bement-Pond, all geared head Lathe, arranged for motor drive.
2—48 x 32 Bridgeford, all geared head, arranged for motor drive.
3—NEW—36 x 40 Bridgeford Lathes, all geared head.
1—42 x 18 New Haven, all geared head, arranged for motor drive.
3—36 x 14 Putnam Lathes, all geared head, motor drive, 220 volt D.C.
2—36 x 18 American, all geared head, motor drive, 220 volt D.C.
1—NEW—30 x 34 American Lathe, taper attachment, belt drive, double carriage.
1—36 x 38 Pittsburgh, all geared head, arranged for motor, two carriages.
1—NEW—36 x 18 Putnam, belt drive.
15—27 x 18 LeBlond, all geared head, motor drive, 220 volt D.C.
4—32 x 25 Ricon, Shafting Lathe, all geared head, arranged for motor drive.
1—28 x 18 Pond Lathe, all geared head, arranged for motor drive.
2—24 x 10 Greaves-Klusman, Lathes, high duty.
5—18 x 6 Monarch Lathes, all geared heads, single pulley, taper.

PLANERS

1—60 x 60 x 20 4-head Woodward & Powell Planer, reversing type 220 D.C. Motor.
1—NEW—48 x 48 x 28 Cincinnati, 2 heads, reversing type, 220 volt D.C. Motor.
1—NEW—48 x 48 x 14 Cincinnati Planer, 2 heads, arranged for motor drive.
1—NEW—48 x 48 x 20 Niles-Bement-Pond Planer, 4 heads, belt drive.
1—48 x 48 x 20 Ridgeway Planer, 3 heads, Motor drive.
1—NEW—42 x 42 x 12 Simmons Openside Planer, 2 heads.
3—36 in. x 36 in. x 20 ft. Woodward-Powell Planers, 4 heads, motor drive.
1—30 in. x 30 in. x 18 ft. Cincinnati Planer, 2 heads.

RADIAL DRILLS

1—6-ft. Cincinnati Bickford Universal Radial Drill.
2—5-ft. Prentiss Plain Radial Drill, arranged for motor drive.
1—7-ft. Warren Semi-Universal Radial Drill, arranged for motor.
Four Spindle Harrington Adjustable Head Drill.
2—20-in. Barnes Drill Presses.

MILLERS

1—Model B Gooley-Edlund Miller.
1—No. 5 Brown & Sharpe Plain Miller.
1—No. 3 Hendey Pl. Miller.
1—Pratt-Whitney Heavy Duty Slab Miller.
25—Whitney, Standard and Becker Hand Millers.
2—No. 5 Brown-Sharpe Vertical Millers.

MOTORS

General Electric Motors, 3-ph., 60-cy., 220-440 volt: 4—1 hp., 15—2 hp., 6— 3 hp., 23—5 hp., 12—7½ hp., 20—10 hp., 46—15 hp., 8—20 hp., 16—25 hp., 1—100 hp.

MISCELLANEOUS

10—32-in. Cincinnati High Duty Shapers, complete.
1—No. 4 La Pointe Broaching Machine.
1—No. 1 La Pointe Broaching Machine.
2—36-in. Fellows Gear Shapers.
1—No. 2A Warner & Swasey Turret Lathe, complete with bar equipment.
1—96-in. Gould & Eberhardt Gear Hobber.
1—NEW—14-in. x 96-in. Norton Plain Grinder.
25—Pratt-Whitney and Leland-Gifford Profilers.
1—18 in. Betts Slotter.

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43-in. x 17-ft. 4½-in. Bement-Niles.
42-in. x 25-ft. Putnam.
32-in. x 12-ft. Pittsburgh, heavy duty, Q.C.G.
26-in. x 11-ft. Wickes, Q.C.G. (2).
28-in. x 16-ft. Fay & Scott.
28-in. x 10-ft. Niles, Q.C.G. (2)
25½-in. x 26-ft. Johnson.
24-in. x 14-ft. Hendey, Q.C.G., taper attachment, oil pan (4).
23-in. x 12-ft. American.
21-in. x 15-ft. 4½-in. Reed.
21½-in. x 8-ft. LeBlonde (2).
20-in. x 8-ft. 6-in. Walcott, D.B.G., Q.C.G. (2).
20-in. x 8-ft. Whitcomb Blaisdell, Q.C.G.
19-in. x 12-ft. Flather.
19-in. x 10-ft. Draper, patent head.
18-in. x 8-ft. American.
18-in. x 6-ft. to 8-ft. Lathes (6).
16-in. Lathes (10).
14-in. Lathes (19).
And many others.

TURRET LATHES

28-in. Pond Triangle.
3 x 36-in. Jones & Lamson.
2 x 24-in. Jones & Lamson.
7 x 14-in. Potter & Johnson, semi-auto (2).
3-in. Pratt & Whitney.
18-in. x 6-ft. Fay & Scott, Universal.
No. 22½ Garvin Monitor.
No. 3 Bardons & Oliver.
14½-in. x 5-ft. Warner & Swasey, open belt, wire feed.

MILLING MACHINES

38-in. x 6-ft. Ingersoll Horizontal Slab.
No. 5 Cincinnati, table 9½ x 50½-in.
No. 15 Garvin, table 12 x 41½-in.
No. 15 Garvin, table 12 x 42-in.
No. 3 Becker Brainard, table 12 x 40-in.
No. 3 Cincinnati.
No. 3 Brown & Sharpe Universal.
No. 27 Industrial Works, Lincoln Type, table 7 x 27-in.
No. 10 Pratt & Whitney Hand.
Whitney Hand.

DRILL PRESSES

48-in. "Universal" full Universal Radials (2).
42-in. Economy Radial.
40-in. Barnes Horiz. Radials (2).
36-in. Bickford Radials, Cir. Base, M.D. (2).
18-in. 4-Spindle, 2-Housing, Foote Burt.
14-in. 6-Spindle Allen Sens. (9).
14-in. 4-Spindle Allen Sens. (4).
32-in. Barnes Sliding Head, B.G.
24-in. Prentice, S.H., B.G., Tapping Attachment.
20-in. Barnes, geared head.
12-in. Allen Bench.
Plain Drills, all sizes.
Drill Presses, assorted sizes.

PUNCH PRESSES

Punch Presses, assorted sizes (96).

HAMMERS

350-lb. Bell Steam.
100-lb. Merrill Upright.
60-lb. Bradley Helve.
60-lb. Bellefonte Upright (3).

KEYSEATERS

24-in. stroke Baker Brothers.
18-in. stroke Morton (2).

MISCELLANEOUS

35-in. x 30-in. x 8-ft. Hendey Planer, Spur Geared.
8-ft. Niles Vertical Boring Mill, double head.
8-ft. Sellers Vertical Boring Mill, double head.
60-in. Newton Car Wheel Boring Machine.
31-in. Newton Car Wheel Boring Machine.
6-ft. Arm Universal Swinging Grinders, 1½-in. spindles (2).
11 x 35-in. Landis Universal Grinder.
12 x 25-in. Bath Univ. Tool & Cutter Grinder.
No. 17 Besly Disc Grinder.
Sellers Horiz. Boring & Drilling Mch. 2⅞-in. spindle.
Industrial Works D.E. Punch and Shear, Cap. ⅝-in. in ⅝-in., squaring ¾-in. x 6-in.
¾-in. National Bolt Cutter.
14-in. Warren Shaper.
Schuchardt & Schutte Tooth Rounding Machine.

In addition to the above I have a large assortment of boilers, Engines and Machine Tools and General Machinery. Let me have a list of your wants. Correspondence solicited.

HERMAN L. WINTERER

941-53 N. Front St., Philadelphia, Pa.

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at Buffalo House Wrecking & Salvage Co., Buffalo, N. Y.

27—Walcott Quick Change **Engine Lathes,** 26-in. x 10-in.
5—Bridgeford **Heavy Duty Lathes,** 27-in. x 10-in.
4—Putman Quick Change **Engine Lathes,** 26-in. x 12-in.
7—Advance Quick Change **Engine Lathes,** 24-in. x 12-in.
5—Ryerson Milwaukee Quick Change **Engine Lathes,** 24-in. x 10-in.
2—Davenport **Engine Lathes,** 22-in. x 10-in.
4—24-in. Baker **Drills,** Heavy Duty.
1—No. 57 Toledo **Nosing Press,** ¾-in. stroke.
1—Special **Turret Lathe,** 22-in. x 12-in.
1—Imperial Type, No. 10 Ingersoll-Rand **Compressor,** 850 cu.ft. per min.
2—14 x 14 Bury **Compressor,** 550 cu.ft. per min.
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1—No. 6 Sturtevant **Blower.**
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1—No. 8 Viking Rotary **Oil Power Pump and Base.**
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4—**Toledo Scales.**
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1—Bury **Compressor,** No. 158.
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Lackawanna **Sheet Piling and Y's.**
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1—No. 7, Type R, 2-hp., D.C., 220-volts, 600 r.p.m.
1—Continuous **Current Motor,** Type C.O., Form A3, 2-hp., 500-volts.
1—Westinghouse **D.C. Motor,** No. 5, Type S, 10-hp., 220-volts, 650 r.p.m.
1—Westinghouse **D.C. Motor,** No. 5, Type S, 15-hp., 220-volts, 1000 r.p.m.
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1—Westinghouse **D.C. Motor,** No. 10, Type K, 40-hp., 220-volts, 525 r.p.m.
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Buffalo House Wrecking & Salvage Co.

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1—20-in. Barnes All Geared Drill.
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1—2½-ft. Canedy Otto No. 51 Wall Radial Drill.
1—3½-ft. Fosdick Holloway Radial Drill.
1—1¾-in. Chicago Universal Electric Drill.
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1—No. 7 Atkins Kwik-Kut Hack Saw.
1—No. 7 Racine H. S. Metal Cutting Machine.
1—Quickwork Power Hammer.
1—No. 3 R. & O. Turret Lathe.
1—No. 3 Woods Tilted Turret Lathe.
3—24 x 8 South Bend Engine Lathes.
1—24 x 10 Dietz Standard Engine Lathe.
1—18 x 10 Schumacher Boye Engine Lathe.
1—No. 1-C Fox Plain Miller.
1—No. 29 Ohio Universal Miller.
1—No. 2 Becker Vertical Miller.
1—No. 1, 10-in. Rock River Punch and Shear.
1—33 x 33 x 8 New Haven Planer.
1—30 x 30 x 8 Pond Planer.
1—24 x 24 x 6 Gray Planer.
1—96-in. Ohl Power Squaring Shear, 16 ga.

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"Everything in Shop Equipment"
Grand Rapids, Michigan.

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LATHE

26 in. x 24 ft. Schumaker & Boye Lathe, taper attachment.

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Betts Horizontal Boring Mill, 3 in. bar.

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OFFERS FOR SALE AT VERY LOW PRICES

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1—26-in. x 12-ft. Complete with 22-ft. 4-in. jaw chuck. Lathe is less than one month old. Will sell cheap before removal.

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Heald No. 75 A-1 Condition.
Price $850 F. O. B. Factory

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34-in. Colburn vertical, one head.

38-in. Niles vertical boring and turning, two heads.

Bement-Miles horizontal, 2½-in. bar.

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No. 2—4-in. Detrick & Harvey horizontal.

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No. 3 Cinn. H.P. vertical, arranged for chain motor drive or single pulley belt drive.

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18 x 96 Norton, arranged for self-contained motor drive (good as new).

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13 x 6 Willard, semi-quick change.
18 x 8 Prentice geared head.
26 x 12 Putnam.
26 x 12 Fitchburg, chuck.

MISCELLANEOUS

30-in. x 30-in. x 8-ft. Pond planer, two heads.

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21-ft. between centers, screw cutting, has face plate 5-ft. diameter, and is now raised to swing 60-in., and there are extra sets of raising blocks to swing 72-in. Five step cone pulley, 4-in. belt, the largest pulley 27½-in. diameter, compound rest, steady rest, tight and loose pulley countershaft. Price $1,750.

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24 x 30 Steam Driven.

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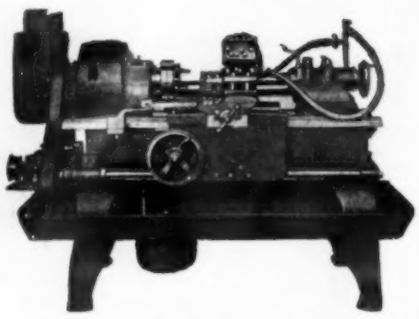

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30, 36, 37 and 51-in.

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42 in. **Gisholt** one plain head, one turret head, chuck in table.

18 in. x 10 ft. Bradford Heavy Pattern **Lathe**, 3 step cone, double back gears.

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No. 0 Foster Screw Machine.

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Slightly Used

Machine Tools

Immediate Shipment

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Also complete machine shop equipment. What have you for sale?

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2—Type "A" Briggs Millers, excellent.
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5—5A Potter & Johnston Automatics.
5—6A Potter & Johnston Automatics.

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5—1¼-in. Hand Screw Machines, new.
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1—LeBlond Universal No. 3, Belt Drive.

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1—1½-in. Ajax Rivet Making Machine, Belt Drive.
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1—26-in. Walcott Shaper, Belt Drive.
1—24-in. Smith & Mills Shaper, Belt Drive.

LATHES

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1—16-in. x 7ft. New Haven, Belt Drive.
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1—21-in. x 8-ft. Bradford, Belt Drive.
1—24-in. x 8-ft. New Haven, Belt Drive.
1—24-in. x 10-ft. LeBlond, Belt Drive.
1—26-in. x 12-ft. Dietz-S-Boye, Belt Drive.
1—30-in. x 23-ft. Pond, Belt Drive.
1—30-in. x 12-ft. Pond, Belt Drive.
1—32-in. x 20-ft. New Haven, Belt Drive.
1—32-in. x 24-ft. New Haven, Belt Drive.
1—34-in. x 18-ft. Putnam, Belt Drive.
1—36-in. x 32-ft. A. S. B. Co., Motor Drive.
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1—18-ft. Wickes, Top Roll 17-in. and 2 Bottom Rolls 12-in., direct connected steam power.
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1—84-in. Pond Vertical, Motor Drive.

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50—Foster Screw Machines. 25 to 1, ⅞-in. capacity, with pans, pumps, and wire feed, $350 each, f.o.b. Boston. 25 No. 2, complete with pan, pumps, and wire feed, capacity 1⅛ in., $400 each, 95% new, been used less than 60 days.

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1—42-16-ft. **Niles Lathe**, double back gear, compound rest, large, hollow spindle, quick change gear, like new. $4000.
1—40-40-12-ft. **New Haven Planer**, all feeds, single head on rail. $1850, f.o.b. cars, Boston. In excellent condition.
1—36-36-15-ft. **Sellers Planer**, all feeds, single head on rail, in excellent condition. $1650.
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1—250-lb. Beaudry Hammer, New, immediate delivery.

Write for further data on this crane if interested.

Will ship any of the above tool 1/3 cash with order, balance sight draft against a Bill of Lading.

Joseph Beal & Company, 23-25 Purchase St., Boston, Mass.

FOR SALE

1—48-in. x 48-in.

SPIRAL GEARED PLANER

with table 14-ft. long between pockets with two heads on cross rail and one head on each upright. Motor driven by 25-hp., 250-1000 R.P.M., 230-volt D.C., Electro Dynamic Company inter-pole, reversing MOTOR and complete Monitor controlling apparatus for driving the planer. The reversing Motor drive gives the variation in cutting speeds of 25-ft. to 60-ft. per minute and a variation in return speeds of from 50-ft. to 100-ft. per minute. The cutting and return speeds are entirely independent of each other. Either can be changed without affecting the other. The cross rail is raised and lowered by a 3-hp., 220-volt, 3-phase, 60-cycle, 1200 R.P.M., Electro Dynamic, A.C. Motor. The distinctive features of this machine are the spiral geared driving system and the fact that the entire driving mechanism runs in oil. The spiral pinion meshes directly with the rack and has at all times 8 teeth in working contact. The spiral pinion is mounted on a shaft which crosses the bed diagonally and is driven by a pair of bevel gears. The bevel gears are rigidly supported and enclosed in a dust and oil tight case and run in oil.

Has been run less than 100 hours.

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Reading, Pa.

PLANERS

1—36-in. x 36-in. x 12-ft. "Rockford" five heads.
1—36-in. x 36-in. x 16-ft. "Flather" two heads.

ATTRACTIVE PRICE.

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NILES VERTICAL BORING MILL

60-in., 2 swivel heads, arranged for motor drive, including 15-hp. variable speed motor, takes 54-in. under the rail. Good condition.

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Excellent Condition

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1—52-in. Rogers & Hemphill Vertical, two heads.

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1—2-spindle Silver b.g. p.f.
1—No. 3-D Minster High Duty.
1—New 4-ft. Mueller Radial, gear box.

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1—14-in. Lees-Bradner Gear Generator
1—36-in. Brown & Sharpe Spur Gear Cutter.
1—48-in. Brown & Sharpe Spur Gear Cutter.

LATHES

1—16-in. x 8-ft. Gray plain rest, loose change gears.
1—16-in. x 8-ft. Lodge & Shipley geared head.
1—16-in. x 8-ft. Walcott & Wood hollow spindle C.R.
1—20-in. x 8 ft. Cisco c.r., q.c.g.
1—26-in. x 12-ft. Bullard triple geared, taper att.

PIPE MACHINES

1—Oster 1-in. to 6-in. pipe machine, power.
1—2½-in. to 6-in. Victor power.
1—2½ to 6-in. Curtis power.

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1—Pratt & Whitney ⅜-in. hand screw machine, auto. chuck.
1—24-in. Steinle Heavy Turret Lathe, 6-in. hollow spindle.
2—2¼-in. x 24-in. Jones & Lamson geared head turret lathes.
1—No. 6-A Potter & Johnston Auto. Chucking and Turning Mch. S.P. drive.

MISCELLANEOUS

1—No. 1 Stewart Gas Oven Furnace.
1—No. 9 Stewart Gas Oven Furnace.
1—No. 18 Stewart Crucible Furnace.
1—12-in. x 24-in. Modern plain grinder.
1—No. 2 Oesterlein plain cutter grinder.
1—Springfield Univ. gauge grinder with motor.
1—Cincinnati plain miller.
1—16-in. x 16-in. x 36-in. Hendey planer, one head.
1—New No. 30 Long & Allstatter O.B.I. press, 2½-in. stroke.
1—No. 3 Burr cold saw.
1—No. 1 Racine saw.
2—No. 2 Marvel saws.
1—No. 1 Garvin tapping machine.
1—No. 8 Lees-Bradner thread miller, 4-ft. 6-in. centers.

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1—No. 68 Bliss **Double Action Press.**
1—Mt. Gilead Hydraulic Press Co., **Hydraulic Press,** 15 tons pressure, Platen 30 x 30.
3—No. 5 Waterbury Farrel Foundry Co. **Presses,** 3-in. stroke.
1—No. 6 Waterbury Farrel Foundry Co. **Press,** 3½-in. stroke.
1—Waterbury **Double Action Press,** Back Geared, 20,000-lb.
1—No. 42 Adriance **Double Action Press.**
1—Geared **Perforating Press.**
1—Watson-Stillman **Hydraulic Press,** 500 tons Pressure.
1—No. 50 **Crosby Press.**
1—No. 31 Bliss **Power Press.**
1—No. 380 West **Horning Press.**
1—No. 168-N Bliss **Automatic Press.**
2— No. 119½-K Bliss **Automatic Presses.**
2—No. 19½ Bliss **Grip Feed Presses.**
4—D-201 Ferracute **Geared Presses,** 25 in. stroke.
4—DGG-56 Ferracute **Geared Presses,** 20-in. stroke.
2—DGG-55 Ferracute **Geared Presses,** 16-in. stroke.
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1—30-in. Peck Stowe **Foot Shears.**
2—No. 2 Leffler **Double Seamers.**
1—Farrel **Gang Slitter,** Heavy Duty, 42-in. between columns, 6 Sets of Knives.
8—American Fox **Monitor Lathes,** 18 x 6, Latest Type.
1—No. 5 Leffler **Back Geared Press.**

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One Pratt & Whitney, No. 1 Two Spindle Gun Barrell

ROUNDING MACHINE

One Ingle Machine Company's Gear Tooth

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60,000 lbs. No. 16 gauge x 1⅝-in. soft cold rolled strip Steel.
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30 Foster No. 1-B

Universal Turret Lathes

All Geared Head

SINGLE PULLEY DRIVE

Complete standard machines with taper attachment—Latest type and design—Guaranteed to be free from worn or broken parts.

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We have $250,000 worth of 90% new machinery. Send us your inquiries.

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52-in. Baush vertical, two swivel heads, good as new.
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14-in. Myers single spindle sensitive.
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4-ft. old style full universal radial.

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24-in. x 14-ft. Lodge & Shipley, selective geared head, with taper attachment, fine condition.
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36-in. x 36-in. x 8-ft. Niles, three heads.
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36-in. x 36-in. x 12-ft. Rockford, heavy duty, two heads.
60-in. x 60-in. x 12-ft. Gleason, three heads.

SHAPERS

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3—24-in. Walcott geared shifting belt.

MISCELLANEOUS

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Detroit centerless grinder, good condition.
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2—6 Spindle **Henry & Wright Drills,** class L.Adj. spindles, solid tables.
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1—**Two Spindle Hoeffer Drill, Worm Drive, Power Feed, 5 Speeds,** three-step cone pulley for 5-in. belt, spindles adjustable horizontally 9-in. min., 18-in. max. **Will take up to 3½-in. drills. Specially low price to save us moving this machine to our warehouse.**
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complete equipment
new machines
built for
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Price: $450 each

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36 x 36 x 14

Two Heads, one on cross rail and one on side.

$1,800.

Slight crack in bed. Does not interfere with its efficiency.

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Boring Mill, 10 ft., 2 swivel heads.
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Drill Grinders, both new and used.
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Reade 50-in Th. S.E. **Punch and Shear,** 1¼ x 1 in.
Garrison M. D. Plate **Shear,** ½ x 81 in.
Mesta Plate **Shear,** ½ x 156 in.

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48-in. Colburn Vertical **Boring Mill,** 2 hds.
42-in. Bullard Vertical **Boring Mill,** 2 hds.
36-in. Niles Vertical **Boring Mill,** 2 hds.
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38-in. New Haven **Drill Press,** b.g.
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36-in. Prentice Radial **Drill Press,** tapp. att.
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16-in. Walcott Rack **Shaper.**
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60 x 60-in. x 10-ft. **Bement-Miles Planer,** 4 hds.
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27-in. x 12-ft. Pittsburgh **Lathe,** d.b.g.
26-in. x 20-ft. 6-in. Putnam **Lathe,** b.g., c.r.
26-in. x 10-ft. 6-in. Walcott Lathe, q.c.g., d.b.g.
24-in. x 12-ft. Boye & Emmes **Lathes,** q.c.g., d.b.g.
24-in. x 6-ft. Gisholt Turret **Lathe,** 6½ in. H. S.
22-in. x 12-ft. Greaves & Klusman **Lathes,** q.c.g.
19-in. x 10-ft. **LeBlond,** M.D., 220-volt, D.C.
14-in. x 6-ft. Hendey **Lathe,** q.c.g.
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No. 2 and No. 3 LeBlond **Plain Millers.**
Nos. 2 and 3 Cleveland **Universal Millers.**
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1—18 ft. Niles **Plate Planer** for 2-in. plates, belt-driven, in excellent condition.
1—Newton 48-in. Rotary Plain **Planing Machine.**
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1—No. 4 Cincinnati Auto **Gear Cutter.**
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9—**No. 6 Whitney Hand Millers.**
1—Pond Vertical **Boring Mill,** 8-ft. table, 11-ft. between housings.
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AT ATTRACTIVE PRICES

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2—Van Norman Hand **Millers.**
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4—16 x 8 Giddings **Engine Lathes,** compound rests.
3—22 x 10 Advance **Engine Lathes,** compound rests, with chucks.
3—Reed-Prentice 18 x 8 **Lathes,** compound rests, quick change gears.
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1—24 x 24 x 6 **Hendey Planer.**
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1—Cincinnati 20 in. **Drill** B.G.
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18-in. x 10-in. x 5-in.
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3-inch bar, latest quick change power feed machine. New. At a special price.

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Latest heavy pattern, with motor drive, mounted on extension of arm. New. At a special price.

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Also a lot of other good new and used machinery all for immediate delivery.

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MODERN TOOLS
at EXCEPTIONALLY LOW PRICES

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18-in. x 8-ft. **Lodge & Shipley Lathes** with oil pans.
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No. 20 Oesterlein **Universal Miller,** 95% new.
No. 3-26-in. **Brown & Sharpe Gear Cutters.**
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24-in. x 24-in. x 6-ft. **American Planer,** one head.
24-in. x 24-in. x 6-ft. **Pond Plainer,** one head.

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IMMEDIATE DELIVERY

2—6 x 15
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Semi-Automatic Lathes

Lathe and Grinders one year old, in excellent condition. Automatics suitable for piston work.

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Will keep count and curve drawing sheet record on 20 producing machines. Operates on 20-v. D.C. service.

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2—16-in. Bilgrams. Regular equipment.

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1—No. 23 Brown & Sharpe for cylinders.
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1—17-in. 2-spindle Jones & Lamson.
3—3 x 36-in. Jones & Lamsons. Geared feed.
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1—5-ft. Western. Triple geared. Heavy duty type. Like new.

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PLANER

1—24 x 24 Pond. Heavy Duty. One Head.

SPUR GEAR MACHINES

3—36-in. Fellows. Regular equipment.
1—No. 2B 24-in. Newark for spurs and bevels.

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1—Hendey. Single End.
2—Whitons. Double Spindles.

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SHAPERS

1—16-in. Stockbridge crank shaper.
30-in. Cincinnati triple geared.
2—15-in. Hendey Shapers. Like new.
1—24-in. Kelly b.g.

PRESSES

2—No. 44 Adriance Double Action.
1—Ferracute P-3 Presses.
1—P-2 Ferracute Press.
1—Bliss No. 16 horning.
6—No. 1-C Standard bench presses, new.
2—No. 2 Baird Double Action.
14—V & O 101 Presses, 5-in. stroke, some have dial feed.
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1—4 V & O, like new.
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6—Sebastian type gap, 15 x 23-in. x 6-ft.
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6—New Excelsior, 14-in. sensitive.
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Cincinnati No. 1 Universal cutter grinder.

MISCELLANEOUS

1—Acme 1½-in. bolt cutter.
1—Schuster ⅝-in. wire automatic forming machine.
2—Model B Cleveland Automatic ⅝-in., like new.
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WE ALSO BUY SINGLE TOOLS OR ENTIRE PLANTS
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IMMEDIATE DELIVERY

ONE 58-IN. X 56-IN. X 14-FT. GORTON PLANER (NEW)

With 35 hp. Reversing Motor Drive, 4 hp. rail elevating motor and necessary electrical equipment, all completely wired.
Two heads on crossrail and two side heads.
Weight approximately 58,000 lb.
Suitable for heaviest railroad shop work or switch and frog work.
Has pump for delivering oil to table ways.

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10—No. 18 Bliss Power Presses.
1—No. 6-8-8 Standard Power Press.
2—Brown Double Action Power Presses.

MILLING MACHINES

1—No. 2 Cincinnati Universal Milling Machine, with dividing heads.
1—No. 3 Cincinnati Plain Milling Machine.
1—Steptoe Plain Milling Machine.

LATHES

1—Putnam 26-in. x 12-ft. Lathe, double back geared, semi-quick change and cabinet legs.
3—New Rahn & Larmon Lathes, [illegible] geared, 18-in. x 6-ft.
1—Greaves-Klusman 16-in. x 8-ft. [illegible]e, Q.C. gear, single pulley drive.

MONITOR LATHES

10—18-in. American Monitor Lathes, complete; built in 1918 and 1919.

DRILL PRESS

1—5-ft. Bickford Radial Drill Press.

GRINDER

1—No. 2 Brown & Sharpe Universal Grinder.

PLANER

1—New Haven Tool Room Planer, 20-in. x 20-in. x 3-ft.

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1—American No. 4 Gas Furnace, opening 24-in. 9-in., with blower.

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New—2 Four Ton Hand Operated 22-ft. 6-in. span **J. C. Spidel** Double girder cranes.

Five ton 3 motor 220 volt D.C., 25-ft. span Electric Traveling Crane.

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3-in. Bar Betts Knee Type Star Feed Facing Head complete in excellent condition.

4-in. Bar Cylinder Boring and **Facing** Machine **Beaman & Smith** motor drive, 28-in. swing, 48-in. centers, weight 12,000 lbs. New condition

LATHES

32-in. x 35-ft. **Bement Miles** Double Lathe, face plate drive, heavy pattern, first class condition.

27-in. x 14-ft. **Lodge & Shipley** motor drive, modern late type machine Q.C.G. 2¼-in. hollow spindle, thoroughly rebuilt.

26-in. x 20-ft. **Perkins** Lathe C.R., P.C.F. Fully equipped, thoroughly rebuilt.

26-in. x 14-ft. **Pond** C.R., P.C.F., 8-ft. 9-in. centers thoroughly rebuilt.

24-in. x 18-ft. **LeBlond** Q.C.G., C.R., P.C.F., 2¼-in. hollow spindle 13-ft. centers, motor drive.

20-in. x 8-ft. **Lodge & Shipley** Q.C.G., C.R., P.C.F., 1¾-in. hollow spindle, taper attachment, thoroughly rebuilt.

18-in. x 10-ft. **Schumacher Boye, Emmes** D.B.G. Q.C.G., C.R., 1¾-in. hollow spindle, thoroughly rebuilt.

18-in. x 6-ft. **Hamilton** D.B.G., C.R., 1¾-in. hollow spindle, taper attachment.

MILLING MACHINES

No. 24 **Garvin** Vertical, table 50-in. x 14-in., latest type, new condition.

No. 1 **Rockford** Plain, table 30-in. x 7½-ft. new condition.

SHAPERS

24-in. **Gould & Eberhardt** Back Geared, Crank motion box table, extension base with support to table. Excellent condition.

28-in. **Jungest** Crank shaper, box table. Complete with vise and countershaft, excellent condition.

MISCELLANEOUS

Drills—2—14-in. **Allen** High speed ball bearing Drills, New Condition.

Grinder—No. 2 Modern Universal Practically New, table 10 x 27-in. complete equipment.

Hammer—150 lb. **Beaudry** No. 6 **Peerless** Power Hammer.

Presses—5 No. 60½ **Bliss** Reducing Presses, rack and pinion movement. Adjustable stroke 4 to 42-in., weight 12,500 lbs.

Pipe Machine—6-in. **Curtis & Curtis** No. 110 power driven. Capacity 2½ to 6. Complete set of dies.

4-in. **Saunders Motor** driven complete with dies. Excellent condition.

Saws—5 No. 2 **Cochrane & Bly** Metal Saws 15-in., blade capacity 4½-in., round 4-in., square n.I-beam.

Used Machinery

1—3 x 36 J. & L. for chucking.
1—10 x 30 Landis plain grinder.
1—No. 2 Hendy-Norton plain milling machine.
1—No. 2 B. & S. plain milling machine.
1—No. 3 Cincinnati plain milling machine.
1—10 x 30 Landis Universal grinder.
3—24-in. Fellows gear shapers.
1—24-in. Fellows Universal gear shaper.
1—19 x 10 Sidney engine lathe, D.B.G., Q.C.G.
1—No. 23 New Britain automatic chucking machine.
1—42-in. Cincinnati vertical drill.
Several 5A and 6A Potter & Johnson automatics.
Several National Acme Automatics.

Vonnegut Machinery Co.
INDIANAPOLIS

For Immediate Delivery

1—15-in. MILWAUKEE BACK GEARED SHAPER, practically new.....$650

1—30 x 30 x 10 POWELL PLANER, two heads, 98% new.....$2,500

1—15-in. BETTS SLOTTER, 95% new, $2,600

2—WALKER ROTARY SURFACE GRINDERS, 12-in. Magnetic Chuck, 95%, $600 each

3—BLOUNT WET TOOL GRINDERS, 20-in. wheel, 95% new .....$110 each

1—GARDNER DOUBLE DISC GRINDER, 90% new $600

1—REED SURFACE GRINDER, 95% new $400

1—NAPIER BAND SAW, 95% new, $450

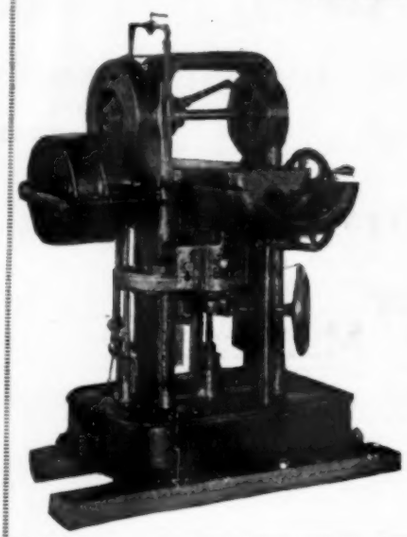
1—COLBURN DRILL $600

1—W. F. & JOHN BARNES UPRIGHT SLIDING HEAD BACK GEARED DRILL PRESS; tight and loose pulley, single pulley drive; speed changes by 5 step cone; quick change gear feeds; hand lever, worm and power feed with automatic stops; excellent condition ..$300

MAIDHOF & ASHTON, INC.
Troy, New York
Industrial Engineers

We Have For Sale in Our Warehouse

65 BRIGGS HIGH DUTY MILLING MACHINES



Type "A," Made by Gooley & Edlund

Used less than one year in the manufacture of light gun parts

Table traverse.....16 in.
Size of table.....24 x 8
Between housings.....12¼ in.
Taper of arbor No. 11 Brown & Sharpe. Maximum distance, table to arbor.....12 in.
Feed changes.....eight
Floor space.....42 x 52
Weight.....2300 lbs.
Some with cone pulleys.

Price, each $400

J. L. LUCAS & SON, Inc.
No. 3 Fox St., Bridgeport, Conn.

NEW AND USED MACHINE TOOLS

Betts, 60 x 60 x 16-ft. **Planer**, two heads on rail, with auxiliary head and sub-base.
21-ft. Carlton Plain **Radial Drill.**
Cincinnati-Bickford 5-ft. **Semi-Universal Radial**, motor driven.
Prentice 26 in. Upright **Drill Press**, with sliding head, and compound tab.e.
United Engrg. & Fdry. Co.'s 300-ton, single frame steam hydraulic **Forging Press.**
4-ton capacity, floor type **Charging Machine or Manipulator.**
Heald 8-in. Magnetic Chuck **Surface Grinder.**
Springfield Machine Tool Co. 18-in. x 6-ft. **Lathe**, with friction head and turret on carriage.
6—New LeBlond 14-in. x 8-ft. Rapid Production **Lathes.**
Ingersoll **Milling Machine**, 30-in. cutter, cutter arbor in horizontal position.
Webster & Bennet double head **Cam Milling Machine.**
8—Wisconsin Hand **Milling Machines.**
Henry & Wright 10-in. Bench High Speed **Drills.**
Nutter-Barnes, 22-in. **Cutting-Off Saw**, 220-volt, D.C., direct connected motor.

THE SEIFREAT-WOODRUFF CO.
622-3 Dayton Savings & Trust Bldg., Dayton, Ohio.
505-506 Gerke Bldg., Cincinnati, Ohio.

Screw Machine Equipment

EXCELLENT CONDITION—IMMEDIATE SHIPMENT

FULLY GUARANTEED

1—No. 55 National Acme, 4 spindle.
1—No. 53 National Acme, 4 spindle.
2—No. 54 National Acmes, 4 spindle.
11—3¼-in. Gridley, single spindle.
3—2¼-in. Gridley, four spindle.
2—2⅝-in. Gridley, four spindle.
1— ⅜-in. Cleveland, 3 hole turret.
2—2 -in. Model C, Cleveland, 3 hole.
1— ⅝-in. Cleveland, 5-hole turret.
1—3¼-in. Cleveland, Serial No. 12,068.
1—2¼-in. 5-hole Cleveland.
1—2¾-in. Cleveland, Model A, 5 hole.
1—2 -in. Cleveland, Full Automatic.
1—1 1/16-in. Cleveland, 5-hole turret.

Write for full particulars

M. J. Walsh Machinery Co., Milwaukee, Wis.

CINCINNATI MILLER

No. 3 **Cincinnati Milling Machine** Plain Single Pulley Drive arranged for motor drive with motor; latest type 95% as good as new; bargain.

S. NEMIROVSKY & SON
137 North Third Street, Philadelphia, Pa.

PLANERS

1—42 x 42 x 22-ft. Detrick & Harvey Openside Planer, 2 Heads.
1—60 x 60 x 16-ft. Pond Machine Co. Planer, 3 Heads.
1—36 x 36 x 12-ft. Pond Planer, 2 Heads.
1—30 x 30 x 16-ft. Rockford Planer, 3 Heads.

LATHE

1—72-in. x 23-ft. John Moore Gap Lathe.

RADIAL DRILL, ETC.

1—5-ft. Western Radial Drill, Motor drive, with gear box.
2—4¼ x 4¾ Cleveland Automatics, Model A.

W. H. BOSWORTH
Commercial Bank Building, Cleveland

EXCEPTIONAL BUY

ROLLING MACHINE
1—Bliss Special; capacity No. 12 US gauge; just the thing for small angles, beeding half-rounds, etc.; cost $3,200. Price, $1,600. Good as new.

ROD AND BOLT THREADING MACHINE
1—¾-in. capacity; cost $200. Price $100. Good working condition.

BUTT WELDING MACHINE
1—Electric; used very little; cost $700. Price, $450.

COMPLETE SET OF DIES AND PATENTS
For the manufacture of steam and hot water radiators of pressed steel. Also large quantity of

RADIATOR FITTINGS
This equipment can be seen at our plant.

THE KANSAS CITY RADIATOR CO.
31st and Genesee Sts., Kansas City, Mo.

FOR SALE

Hammer, Truck, Lathes, Grinder

1—1000-lb. E. W. Bliss **Drop Forging Hammer.**
1—4000-lb. **Baker R. & L. Electric Industrial Truck.** Condition 98%. Twenty-two cells, Model QUQ, four-wheel drive, and four-wheel steer.
2—21-in. **LeBlond Lathes,** equipped with 15-in. three-jaw Universal Chucks and Taper Attachments.
1—**J. A. Stowell Grinder,** Saxon No. 2.

RICHMOND FORGINGS CORPORATION
(Acca) Richmond, Va.

War Department

ORDNANCE SALVAGE BOARD

Surplus Property Sales

Opportunities for All

Consumer—Retailer—Dealer—Jobber—Wholesaler—Manufacturer

The U. S. Ordnance Salvage Board is offering for sale through its several District Offices, listed below, large quantities and diversified classes of Materials and Equipment. The items detailed on the following pages are given merely as a suggestion of these various classifications. Read each page carefully. The items described are listed under the respective Districts by which they are held; they are not grouped into classifications.

These sales embrace items of value to almost every branch of modern industry.

Materials to be sold by NEGOTIATION

Sales methods are simple. All items, unless otherwise stated, are offered for sale by negotiation, and in lots sufficiently small to give all prospective purchasers an opportunity to buy.

IMPORTANT—Statements as to chemical analysis, specifications, conditions, or exact quantities are based on the best information available, but no guarantee on behalf of the Government can be given. Purchaser will be required to accept the material "as is" in its present condition. Inspection is therefore invited. Failure to inspect will not be considered a warrant for rejections or cancellation.

CERTIFIED CHECK, cashier's check, draft or legal tender for full amount must accompany shipping instructions. Checks to be made payable to the Treasurer of the United States.

ALL OR ANY PART of material listed may be bid on or sold.

UNIT—Submit bid in terms of unit listed, that is, quote price per piece, foot, gallon, 100 lbs., or gross ton, etc.

F.O.B. POINT—Quote price f.o.b. cars at plant where material is located or "on ground" if contractor buys material at his plant.

WEIGHTS—Government weights at point of shipment will govern.

DIFFERENCES IN WEIGHTS—If any difference between the weights indicated in this Bulletin and the actual weights should be discovered, the Government will refund or forward an invoice to the purchaser to cover any discrepancy and final settlement will be based on affidavits as to correct weights.

SHIPPING INSTRUCTIONS stating desired rate of delivery and name of delivering railroad in writing must reach the Committee interested within fifteen days from date award is made. The Government reserves the right to forward the entire shipment at a steady rate or as rapidly thereafter as shipping facilities will permit, unless special arrangements at time of purchase are made with the Committee to modify shipping procedure.

DEMURRAGE—The Government is not responsible for any demurrage, and any such charges accruing shall be paid by the purchaser.

SUBJECT TO PRIOR SALE

All items offered are subject to prior sale. Place your order promptly. Write or telegraph today.

Get the Weekly DISTRICT BULLETINS

This advertisement covers only a small part of the materials and equipment offered for sale by the several Ordnance District Salvage Boards. Each District Office issues a weekly bulletin which describes in detail what that particular District has for sale. Write to the District Offices for their bulletins. The current copies will be mailed to you promptly.

If you desire to receive regularly the bulletins of any or all of the Districts, request that your name be placed on the mailing lists.

Watch for Succeeding Announcements

Ordnance District Salvage Boards:

District	Address		Telephone Number
Boston	19 Portland St.	Boston, Mass.	Army Wire
Baltimore	Columbia Ave. at B. & O. R. R.	Baltimore, Md.	
Bridgeport	945 Main St.	Bridgeport, Conn.	Noble 791
Chicago	74th and Ashland Ave.	Chicago, Ill.	Vincennes 3500
Cincinnati	3rd and Vine Sts.	Cincinnati, Ohio	Main 3732
Toledo	Storage Depot, No. 1	Cleveland, Ohio	
Detroit	35 Washington Blvd.	Detroit, Mich.	Cadillac 7680
New York	1107 Broadway	New York City	Army Wire
Philadelphia	1710 Market St.	Philadelphia, Pa.	Locust 5120
Pittsburgh	Neville Island, Coraopolis, Pa.	Coraopolis, Pa.	30162
Rochester	1048 University Ave.	Rochester, N. Y.	Chase 4480
St. Louis	Missouri State Life Bldg.	St. Louis, Mo.	Olive 6960
Montreal	Notre Dame St., East, Montreal, Can.	East Montreal, Canada	
Old Hickory	Jacksonville, Tenn.	Jacksonville, Tenn.	

See following pages for detailed descriptions of items offered

War Department
ORDNANCE SALVAGE BOARD
Surplus Property Sales

NEW YORK DISTRICT— 1107 BROADWAY, NEW YORK, N. Y.
Telephone: Army Wire

MILLERS

3—**Becker Milling Machine Co.,** Milling Machines, No. 1. Located at M. M. & M., Jersey City, N. J.

7—**Garvin Machine Co.,** Profile Milling Machines, double spindle, No. 1. Location: U. S. A. S. B., Port Newark, N. J.

9—**Pratt & Whitney Co.,** Profile Milling Machines, No. 12. Located at U. S. A. S. B., Port Newark, N. J.

4—**Putnam Machine Co.,** Profile Milling Machines, No. 720. Located at U. S. A. S. B., Port Newark, N. J.

GRINDERS

9—**Norton Grinding Co.,** Plain Cylindrical Grinders, 10-in. x 36-in., drive, line-shaft and belt. Located at U. S. A. S. B., Port Newark, N. J.

RIFLING MACHINES

6—**Sloan & Chace Mfg. Co.,** 36-in. Rifling Machines. Located at S. & C. M. Co., Newark, N. J.

The New York District has also to sell additional quantities of machine tools, motors and building equipment, textiles and textile machinery, wrought iron pipe, metals and chemicals.

The latest New York District Bulletin gives full details. Write for it.

PRESSES

5—**Ferracute Machine Co.,** Power Presses, No. P3. Located at U. S. A. S. B., Port Newark, N. J.

7—**E. W. Bliss Co., No. 16** horning and wiring type Power Presses. Located at U. S. A. S. B., Port Newark, N. J.

SCREW MACHINES

2—**Brown & Sharpe Mfg. Co.,** Automatic Screw Machines, No. "00G." Located at U. S. A. S. B., Port Newark, N. J.

4—**Cleveland Automatic Machine Co.,** Automatic Screw Machines, No. 5024, size ⅜-in. "B" plain. No. 6786, size ⅝-in. "A" full. No. 3004, size ⅝-in. "B" plain, and No. 3494, size ⅞-in. "A" full. Located at U. S. A. S. B., Port Newark, N. J.

AUCTION SALE
At Nixon Nitration Works, Nixon, N. J.
BEGINNING WEDNESDAY, JULY 7. 1920 at 11 A. M.

250,000 lbs. Barium Nitrate
250,000 lbs. Aluminum Bronze Powder
2,000,000 lbs. Scrap Brass
400,000 lbs. Cartridge Cases
125,000 lbs. Scrap Copper
750,000 lbs. Brass Discs
400,000 lbs. Scrap Lead

Miscellaneous Materials, Stoves, Electrical Equipment, Etc.

For further information apply to Committee on Sale of Materials, N. Y. Dist. Ordnance Salvage Board, 1107 Broadway, New York City, or Mr. Alfred Freeman, Auctioneer, 149 Grand St., New York City.

Write TODAY for latest current BULLETIN

War Department

ORDNANCE SALVAGE BOARD

Surplus Property Sales

CHICAGO DISTRICT—74 E. ASHLAND AVE., CHICAGO, ILL.

Telephone: Vincennes 3500

ENGINE LATHES

6—**Canada Mach. Corp.,** 26-in. x 10-ft., 3-step cone, double back gears, compound tool rest, quick change gears. Location: Chicago Storage Depot.

HEAVY DUTY ENGINE LATHES

3—**R. K. LeBlond Mach. Tool Co.,** 21-in. x 8-ft., 3-step cone, double back gears, quick change gears, 4 way tool turret post equipped with special air chuck and profiling attachment. Location: Chicago Storage Depot.

2—**Lodge & Shipley,** 30-in. x 38-ft. special gun lathe. Location: Northwestern Ord. Co., Madison, Wis.

LO-SWING LATHES

2—**Fitchburg Mach. Co., 8-in. x 108-in.,** geared head, single pulley. **Location:** Chicago Storage Depot.

TURNING LATHES

7—**Niles-Bement-Pond Co., 30-in. x 13-ft.,** Axle turning lathes, double. **Location:** Chicago Storage Depot.

TURRET LATHES

4—**Steinle Turret Mach. Co.,** 24-in. x 8-ft., 6¼-in. hole spindle, without carriage. Location: Chicago Storage Depot.

2—**Steinle Turret Mach. Co.,** 24-in. x 8-ft., 6¼ hole in spindle. Location: Chicago Storage Depot.

4—**Steinle Turret Mach. Co.,** 24-in. x 10-ft., 6¼-in. hole through spindle. Location: Chicago Storage Depot.

NICKEL STEEL

Lot 3616—Approx. 58,138 lbs. ⅝-in. round nickel steel 14-ft. to 18-ft. long. 70,105 lbs. ¾-in. round nickel steel 14-ft. to 18-ft. long. Location: La Salle Steel Co., La Salle, Ill.

SCRAP STEEL

Lot 3496—Approx. 396,505 lbs. steel scrap. Location: Diamond Iron Works, Minneapolis, Minn.

Chicago District offers for sale the items listed on this page only

AT FIXED PRICES

No Delays **No Restrictions**

The information covering machines and equipment listed on this page has been obtained from the best sources available. The Government invites inspection before purchase, and assumes no responsibility as to conditions or completeness.

All Machines and equipment listed on this page are subject to prior sale. No options will be granted.

Sales Will Be Made for Cash Only

Information regarding inspection, location, etc., may be obtained upon application to Chicago District Ordnance Salvage Board, 74th St. and Ashland Avenue, Chicago, Ill. Phone Vincennes 3500.

The Chicago District also offers for sale additional surplus machinery and metal items, miscellaneous power, electrical, chemical, hardware and shop equipment items, all of unusual interest to machine shops and metal working plants. Send for the latest Chicago District Bulletin which gives COMPLETE details.

CHUCKING GRINDERS

3—**Bryant Chucking Grinder Co.,** Internal Grinder No. 10. Location: Chicago Storage Depot.

PLAIN CYLINDRICAL GRINDERS

1—**Cincinnati Grinder Co.,** No. 4, 72-in. x 12-in. Location: Chicago Storage Depot.

1—**Cincinnati Grinder Co.,** 16-in. x 80-in. Location: Twin City Forge & Foundry Co., Stillwater, Minn.

1—**McDonough Mfg. Co.,** 18-in. x 50-in., Sterling Power feed. Location: Chicago Storage Depot.

MILLING MACHINES

2—**Ingersoll Milling Mach. Co.,** 30-in. x 24-in. x 10-ft. Double vertical adjustable rail arranged for 15 HP. motor drive, hand and power drive. Location: Chicago Storage Depot.

AUTOMATIC SCREW MACHINES

2—**Windsor Machine Co.,** Gridley auto. single spindle, 2⅝-in., 4-tool turret. Location: Chicago Storage Depot.

4—**National Acme Co.,** Gridley auto., 2⅝-in., 4-tool turret, single spindle. Location: Chicago Storage Depot.

HAND SCREW MACHINES

2—**Greenlee Mach. Tool Co.,** 2¼ x 26. Flat turret for bar stock. Location: Chicago Storage Depot.

2—**Cleveland Auto Screw Mach. Co.,** single spindle, 5-hole turret, No. 57—2¼ x 3¼; No. 65—2¼ x 2⅝. Location: Chicago Storage Depot.

to any District Office—See First Page of this Advertisement

War Department

ORDNANCE SALVAGE BOARD

Surplus Property Sales

PHILADELPHIA DISTRICT — 1710 MARKET ST., PHILADELPHIA, PA. Telephone, Locust 5120

METALS

BRASS CARTRIDGE CASES

LOT 1330—50,000 pcs. 75 m.m. Brass Cartridge Cases, 14-in. high, 3⅝-in. base, 3-in. open top, 137,500 lbs. To be used for melting scrap purposes only. Analysis—Copper 70%; Zn. 30%. Location: Woodbury General Ordnance Depot, Westville, N. J.

LOT 1331—100,000 pcs. 75 m.m. Brass Cartridge Cases, 14-in. high, 3-in. open top, 3⅝-in. base, 275,000 lbs. To be used for melting scrap purposes only. Analysis—Copper 70%; Zn. 30%. Location: Woodbury General Ordnance Depot, Westville, N. J.

LOT 1332—200,000 pcs. 75 m.m. Brass Cartridge Cases, 14-in. high, 3-in. open top, 3⅝-in. base, 550,000 lbs. To be used for melting scrap purposes only. Analysis—Copper 70%; Zn. 30%. Location: Woodbury General Ordnance Depot, Westville, N. J.

LOT 1333—400,000 pcs. 75 m.m. Brass Cartridge Cases, 14-in. high, 3-in. open top, 3⅝-in. base, 1,100,000 lbs. To be used for melting scrap purposes only. Analysis—Copper 70%; Zn. 30%. Location: Woodbury General Ordnance Depot, Westville, N. J.

BRASS RODS

LOT 1239—12,033 lbs. Hard Rolled Brass Rod, 1¾-in. 128,636 lbs. Hard Rolled Brass Rod, ⅞-in. Location: Mays Landing General Ordnance Depot, Mays Landing, N. J.

LOT 1240—254,134 lbs. Rd. Brass Rod, ⅞ in. 399,842 lbs. Rd. Brass Rod, 51/64-in. Location: J. L. Mott Co., Trenton, N. J.

COPPER

LOT 1401—Approximately 42,752 pcs. 75 m.m. Copper Bands, unit weight .25 lbs, total weight 10,688 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

LOT 1404—Approximately 264,647 pcs. 4.7-in. Copper Base Covers, unit weight .129 lbs, total weight 34,140 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

LOT 1406—Approximately 100,012 pcs. 155 m.m. Mark IV. Copper Base Covers, unit weight .151 lbs, total weight 15,102 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

LEAD—Antimony

LOT 1414—Approximately 5,078,473 pcs. Bouchon Assemblies (Lead-Antimony Components), total weight 900,155 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

STEEL

LOT 1326—Approximately 60,000 lbs. Steel Bars, 7-in. x 6-in. x 24½-in. long. Analysis—C. .50 .60; M. .40 .80; Phos. .05; SV. .06; Si. .10 .30. Location: Bethlehem Steel Co., Bethlehem, Pa.

LOT 1327—Approximately 67,500 lbs. Steel Bars, 7-in. x 6-in. x 24½-in. long. Analysis—C. .50 .60; M. .40 .80; Phos. .05; SV. .06; Si. .10 .30. Location: Bethlehem Steel Co., Bethlehem, Pa.

STEEL SCRAP

LOT 1412—60,597 pcs. 6-in. T. M. Shell Adapters, steel (uncompleted), total weight 90,237 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

LOT 1413—Approximately 5,896 pcs. 5-in. H. E. C. H Steel Shells, unit weight 64 lbs., total weight 377,344 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

LOT 1259—1,072,500 pcs. 25 m.m. (primed) Cartridge Cases, .0966 lbs. each, total weight 103,604 lbs. Location: Nitro General Ordnance Depot, Nitro, W. Va.

ZINC

LOT 1029—8,969 No. 7 gauge, 55⅜-in. x 26⅜-in. 46,039 lbs. Zinc Body Sheets. Location: Union Plant, Hercules Powder Co., Gillespie, N. J.

ENGINE LATHE

1—Niles-Bement-Pond Co., New York City., Lathe, engine heavy duty, size 26-in. x 25-ft. Will swing over carriage 26-in., taper attachment, compound rest, steady rest back geared, face plate, 2 male centers, cross slide, carriage is equipped with friction feed, compound rest, operated by hand. Plain geared lathe countershaft tight and loose pulleys. Location: Frankford Arsenal, Frankford, Pa.

TURRET LATHE

1—Steinle Turret Machine Co., Madison, Wis., 24-in. x 9-ft. four tool Turret Lathe, 118-in. chuck, 3-jaw automatic and hand feed carriage, screw for quick change gears, pump and piping, cast-iron chip pan 23-in. x 66-in. x 6-in., 2-step cone, friction drive (back geared drive). Location: Frankford Arsenal, Frankford, Pa.

MACHINERY

GRINDERS

1—Heald Machinery Co., Worcester, Mass., Internal Grinder, No. 75, equipped with 3-jaw Universal chuck, hand feed, head stock Universal, for grinding parallel or taper holes. Maximum diameter of work will take 12-in. (cup wheel) Spindle has draw in bar for collets. Location, Frankford Arsenal, Frankford, Pa.

2—Middlesex Machine Co., Middletown, Conn., Universal Tool Grinder, with three-jaw independent chuck, largest diameter emery wheel will take 9-in. spindle equipped for two emery wheels, cross slide and table operated by hand wheel. Location: Army Reserve Depot, New Cumberland, Pa.

3—The Morse Twist Drill Co., New Bedford, Mass., No. 1 Plain Grinder, length of table 37-in., equipped with head and tail stock, 2-cone drive, one wheel mount with emery wheel attached, automatic feed, complete table has swivel gauge for taper grinding, pump attached, largest diameter with swing 4-in. Location: Army Reserve Depot, New Cumberland, Pa.

1—Wilmarth & Morman, Grand Rapids, Mich., size 88-in., spindle equipped with 2-wheel mounts, table and cross slide, automatic feed, vertical movement table operated by hand wheel, for cylindrical grinding (parallel and taper) countershaft, tight and loose pulleys. Dimensions of table 3-ft. 6-in. x 5½-in. Location: Frankford Arsenal, Frankford, Pa.

HAND MILLERS

2—Van Norman Machine Tool Co., Springfield, Mass., Miller, hand, size No. 1, 3-step cone, direct drive, overhanging arm with cast-iron bracket attached, cross slide operated by hand, table operated by hand lever, 2 adjustable table stops, crank handle for operating cross slide, table dimensions 22-in. x 5½-in. Direct drive. Location: Frankford Arsenal, Frankford, Pa.

1—F. S. Perkins Co., Lowell, Mass., Lathe Engine, size 26-in. x 10-ft., maximum over cross slide 15-in. plain tool rest, large face plate, 2 male centers, back geared, belt and gear feed for carriage, cross slide, double friction countershaft, plain geared lathe. Location: Frankford Arsenal, Frankford, Pa.

The Philadelphia District has also to offer for sale additional quantities of metals, machinery and miscellaneous shop equipment, chemicals and chemical equipment, electrical equipment and hardware items. Complete details are in the latest Philadelphia District Bulletin. Sent on request.

Write TODAY for latest current BULLETIN

War Department

ORDNANCE SALVAGE BOARD

Surplus Property Sales

BOSTON DISTRICT—19 PORTLAND ST., BOSTON, MASS.
Telephone, Army Wire

COLD DRAWN STEEL

372,000 lbs. (approx.) 1-$\frac{7}{8}$ in. rd. Cold Drawn Steel. Location: R. B. Phillips Mfg. Co., Worcester, Mass.

914,778 lbs. of 1-$\frac{7}{8}$ in. rd. Cold Drawn Bessemer. Location: Chapman Mfg. Co., Winchester, Mass.

See the first page of this advertisement for general sales conditions. Quote price per net or gross ton F.O.B. cars shipping point. Shipments of this material shall begin within ten days, insofar as possible, from the date of the award and continue at a steady rate to the best ability of the Government.

The material can be inspected before the date of sale at locations designated. Failure to inspect will not warrant rejection.

The U. S. Government reserves the right to accept or reject any and all bids or any portion thereof, and waives all technicalities.

BRIDGEPORT DISTRICT—945 MAIN ST., BRIDGEPORT, CONN.
Telephone, Noble 791

CHUCKING AND TURNING MACHINE

1—Potter & Johnston, No. A Auto-Chucking and Turning Machine. Location: U. S. Government Warehouse, No. 193, Bridgeport, Conn.

THREADING LATHE

1—Automatic Machine Co., 12 in. x 4 in., Threading Lathe. Location: U. S. Government Warehouse, No. 193.

MILLER (Automatic)

1—Pratt & Whitney, 12 in., Heavy Type. Location: U. S. Government Warehouse, No. 193, Bridgeport, Conn.

PROFILERS

3—Pratt & Whitney, No. 14, 3 spindle Profilers. Location: U. S. Government Warehouse, No. 193, Bridgeport, Conn.

The Bridgeport District has also additional quantities of machinery, power and miscellaneous shop equipment for sale. If interested send for the latest Bridgeport District Bulletin, which gives full details.

GENERATOR

1—85 kw. General Electric D.C. Generator. 250 volt, compound-wound, 750 r.p.m., belt driven, complete with pulley rails and Blue Vermont Marble, operating panel with rheostat, instruments and circuit switches. All in first-class order. Location: Springfield Armory, Springfield, Mass.

BLOWERS

2—Blower special, two-beach russ No. 10, belt driven pressure blowers, 500 cu.ft. per minute. Capacity at 5 lb. pressure. Practically new. Location: U. S. Government Warehouse, No. 193, Bridgeport, Conn.

to any District Office—See First Page of this Advertisement

Desirable New and Used

POWER PLANT

Machinery

at attractive prices

IMMEDIATE DELIVERY

Send for latest copy of

"T. P. Economist"

listing 500 items including

Fans, Pumps, Motors, Evaporators, Tanks, Engines, Air Compressors, Cranes, Autoclaves, Ice Machines, Mixers, Generator Sets.

WATER TUBE BOILERS

CG237. 14—264-hp. B. & W. boilers. Drums double riveted, lap joint, 150 lb. pressure.

CG284-A. 2—302-hp. B. & W. boilers for 160 lb. 3,021 sq.ft. heating surface each, in two batteries, 16 sections of 9 4-in. x 18-ft. tubes. Perfection grates, 68 sq.ft. Full front. Murphy stokers, feed pumps and heater. Space per two boilers, 24-ft. 2-in. x 20-ft. 2-in. deep, 16-ft. 8½-in. floor to steam outlet flange. Hartford inspected. Pa.

TP1663-A. 350-hp. Erie City vertical water tube boiler, 125 lb., Butt strap, double riveted. Heating surface 3,741 sq.ft. Grates 8 x 7 ft.

CG338-A. 3—400 hp. B. & W. boilers. Heatinf surface 4,000 sq.ft. Drums double riveted, lap joint. American underfeed stokers. Pressure 160 lb.

CG272-A. 2—400-hp. Wickes water tube boilers, A. S. M. E. code, 150 lb. pressure.

CG294. 500-hp. Sterling boiler, class F, No. 30 drums lap riveted, 150 lb.

CG410-A. 4—600-hp. Babcock & Wilcox boilers. New, never set up. 200 lb. steam pressure. Built according to A. S. M. E. Boiler Code. Each boiler has 6,001 sq.ft. heating surface, Dietrich arches, Detroit stokers. Md.

HEATERS

TP-1651-E. 500-hp. Moffat open type feed water heater.

HG-1393. 775-hp. F. L. Patterson closed straight flow feed water heater, 300 sq.ft. Va.

HG-1392. 9—5,100-hp. Alberger Pump & Cond. Co. closed. Wainwright Even Flow feed water heaters, 1,500 sq.ft. Va.

HG-1351. A 7,500-hp. Warren-Webster open feed, water heater, equipped with Lea V notch recording meter, 160 sq.ft. 400,000 lb. water per hour. Va.

LOCOMOTIVES

TP-1640-J. 2 Electric locomotives, 36-in. gauge, capacity 8 to 10 tons, weight 3,600 lb. each, 4-ft. wide, 5-ft. long. With necessary battery.

TP-1640-K. 3 Industrial tractors, capacity 5 to 7 tons. 36-in. gauge, weight 2,400 lb. With 30 A4 Edison cells each. Width 37-in.; length 48-in. over all.

ON-1745-A. 2—5-ton storage battery locomotives, 36-in. gauge, with 40 cells MV 13 iron clad oxide storage battery. Capacity 189 amps., 80 volts, draw bar pull 800 lb., 5.2 miles per hour.

NR-2009. 20—36-in. gauge electric locomotives, height of platform 2-ft. 3-in.; wheels 16-in. x 3-in.; length over all 12-ft. 3-in. Battery 40 cells W.M.L., 13 Phila., 2 10-hp. motor with double reduction gear and drum type controller. Weight 7,000 lb.

TECHNICAL PRODUCTS CO., Inc.

501 Fifth Ave., New York

Revolving Automatic Hardening and Annealing Furnaces

We own and offer for sale for immediate delivery and especially low-priced immediate disposal the following furnaces. One machine is set up in position for convenient inspection, and all are practically brand new. Quoted subject to prior sale and f.o.b. Derby, Conn.

Seven W. S. Rockwell Co. No. 77 (new No. 152) internally fired revolving, annealing and hardening furnaces, complete. Average capacity approximately 700 pounds per hour. The body of each is eight feet long by thirty inches in diameter, and is fitted with cast-iron lining and hopper type feed, adjustable heads and beneath controlled floor discharge, and are suitable for oil burning. Machines are mounted on heavy channel iron frames, and are operated by worm gear, driven by variable speed countershafts; chain drives. They are used for annealing and hardening large quantities of brass, copper and steel parts.

One W. S. Rockwell Co. Tank, 33 feet long and nine feet in diameter, ¼-inch boiler plate iron. Capacity 15,000 gallons, and contains at present about 3,000 gallons of crude oil.

Wire, phone or write immediately

The Standard Machinery Company

New Haven, Connecticut

Tel. Colony 265—453 Chapel Street

FOR SALE

40,000 Lb. High Speed Steel Annealed

Champion, Colonial, Midvale Extra Star Zenith, etc.
$\frac{3}{16}$-in. round to 6¾-in. round, flats and squares.

ALL MATERIALS NEW

Price $1.00 per pound, special prices for quantities.

List furnished on request.

E. NESS CO., SAVANNAH, GA.

1—3¾ B toggle

BLISS DRAWING PRESS

built 1917, fine condition, immediate delivery.

J. Gelb & Company

201 Centre St., New York City

FOR SALE BY

R. C. FELTES

549 W. Washington Blvd., Chicago, Ill. Room 300

I have the following

Portable Electric Drills and Grinders For Sale

2—¾-in. **110-volt Universal Motor Electric Drills.**
2—**Type "H" U. S. Center Grinders,** 110 volts, D.C.
1—Type OBA. U. S. **Portable Grinder,** 110 volts, A.C.
1—¾-in. U. S. **Electric Drill,** 110 volts, D.C.
1—1-hp. Angle Plate Willey **Lathe Grinder,** 110 volts, A.C.
1—U. S. Type ML. Internal and External **Grinder,** 220 volts, D.C.
Several used ¼-hp. D.C. and A.C. **Motors.**
1—2-hp. Pedestal **Buffer,** 110 or 220 volts, D.C.

PHILADELPHIA STOCK

4—Porter Cable Manufacturing **Lathes,** 9-in. swing, 20-in. between centers.
6—No. 53 Toledo Straight Column **Fly Wheel Presses,** 3½-in. stroke.
1—No. 4 Warner & Swasey **Turret** Screw Machine.
1—No. 107 Curtis & Curtis **Pipe Threading Machine,** 2½-in. to 12-in.

J. N. MOYER

Machinery and Supplies. 905 Crozer Bldg., Philadelphia, Pa.

DAVID A. WRIGHT

MACHINERY — DAVID A. WRIGHT — EQUIPMENT — CHICAGO

Machinery Equipment

568 W. Washington Blvd. **Phone; Franklin 5899** **Chicago, Ill.**

New, Used and Rebuilt Machinery for Immediate Delivery

Complete list now ready. Mail us your inquiries.
We buy complete plants. What have you to sell?

75--No. 3 NILES AXLE LATHES

10—3½ x 60-in. Low Swing Lathes.
10—14 x 6 Reed Prentice Lathes.
2—17 x 6 LeBlond Lathes, quick change gears, (new).
2—17 x 10 LeBlond Lathes, quick change gears, (new).
4—18 x 8 LeBlond Lathes, quick change gears, (new).
1—30 x 13-ft. 6-in. Oliver, A.G.H., Q.C.G. Lathe, new.
1—36 x 20-ft. Bridgeford, H.D., Q.C.G. Lathe.
1—36 x 26-ft. Bridgeford, H.D., Q.C.G. Lathe.

MILLERS

10—No. 3½ Fox Hand Millers, power feed.
2—No. 12 Brown & Sharpe Manufacturing Millers.
2—No. 12 Cincinnati Manufacturing Millers.
1—No. 1½ Rockford Plain Miller.
1—No. 3 LeBlond Plain Miller.
1—No. 4 Cincinnati Plain Miller, vert. attach.
1—No. 1½ Rockford Universal Miller.
1—No. 2 M. U. Garvin Universal Miller.
1—No. 4 Becker, vert. Miller.

PUNCH PRESSES

1—No. 58 Toledo S.S. Punch Press, 7-in. stroke.
1—No. 77½ Bliss S.S. Punch Press, 10-in. stroke.
2—No. 55 Cleveland D.B.G., S.S. Press.

TURRET LATHES

1—24-in. Libby Turret Lathe.
6—24-in. Gisholts.

PLANERS

1—24 x 24 x 6-ft. Gray Planer, one head.
1—24 x 24 x 6-ft. Pond Planer, one head.
1—36 x 36 x 12-ft. Cleveland Open Side Planer.

DRILLS

1—No. 25 Foote Burt Drill.
4—D-4 Colburn Drills.
1—No. 30, 24-spindle Natco Drill.
1—9-spindle Pratt & Whitney Gang Drill.
1—10-spindle Natco Multiple Drill.

GRINDERS

1—No. 16 26-in. Blanchard Grinder.
1—20 x 96 Landis Plain Grinder.
1—20 x 96 Norton Plain Grinder.
1—18 x 120 Norton Plain Grinder.

SHAPERS

1—16-in. Queen City B.G. Shaper.
1—26-in. Cincinnati B.G. Shaper.
1—20-in. Gould & Eberhart Shaper.
1—24-in. Ohio B. G. Shaper.

MISCELLANEOUS

1—No. 2 LaPointe Broaching Machine.
1—3-in. Acme Bolt Cutter.
1—No. 4 Gladder Improved Wire Nailing Machine.
1—No. 2 Moore Heavy Screw Press.

A Few Choice Bargains

MILLING MACHINES

3—18-in. B. G. Cincinnati Plain Milling Machines, nearly new.
1—No. 2 Becker Plain Miller, latest type.
2—No. 25 Becker Plain Millers, nearly new.
6—U. S. Hand Millers.
12—No. 3 Burke Bench Millers, nearly new.

LATHES

1—18-in. x 7-ft. Pratt & Whitney Lathe, all geared head, quick change gears, taper att., perfect condition.
1—16-in. x 6-ft. Seneca Falls Lathe, pan Bed, quick change gear, drawing-in-att., taper att., automatic micrometer cross feed. Perfect condition.
1—14-in. x 6-ft. Seneca Falls Lathe, quick change gear, drawing-in-att., micrometer cross feed. Perfect condition.
1—14-in. x 6-ft. Carroll-Jamieson Lathe, quick change gear, double B.G., good condition.
1—Warner & Swasey Hollow Hexagon Turret Lathe, 2-in. cap, complete, large number extra box tools, perfect condition.
1—Cincinnati Acme 3¼-in. x 36-in. Flat Turret Lathe, cone driven for bar work, enormous quantity tools, nearly new.
10—No. 4 Warner & Swasey Hand Turret Lathe with bar feed att., Hexagon Turret B.G. friction head, nearly new.

PLANERS AND SHAPERS

1—26-in. x 26-in. x 6-ft. Pond Heavy Duty Planer, perfect condition.
1—26-in. x 26-in. x 6-ft. Pease Heavy Duty Planer, perfect condition.
1—16-in. x 16-in. x 3-ft. Pratt & Whitney Tool Room Planer.

DRILL PRESSES

1—4 Spindle Barnes Camel Back, all geared drill press.
1—24-in. Niles Drill Press B.G., sliding head, power feed.
18—Allen Single Spindle, Heavy Duty, high speed drill presses.

MISCELLANEOUS

6—Fitchburg Lo-Swing Lathes, attractive bargain.
2—101 V. & O. Reducing Presses, 6-in. stroke with dial feeds.

Large stock of high-class Machine Tools in stock. Entire Plants and Single Tools Purchased for Cash.

ACME MACHINERY EXCHANGE
196 Centre Street, New York.

Who supplies *machines* for the manufacture of *steel-belt pulleys?*

Offers H. E. 315, Ala-Haasenstein & Vogler, Magdeburg

FOR SALE

The output of two No. 52 and one No. 515

Acme Automatic Screw Machines

Also three presses on metal stampings, material .125 and under.

GEO. J. KELLY CO.
505 Washington St., Lynn, Mass.

WANTED

POWER PRESSES

Ten 1-in. and 1½-in. stroke. Must be in first-class condition. *V & O No.* 01 preferred or lighter.

AJAX FASTENER CO.
145 West 28th St., New York

WANTED

OPEN SIDE PLANER

(Walker Planer)

Manufactured by
Pedrick & Ayres, Philadelphia, Pa.

Dimensions

Travel of Head 9 ft. 6 in.
Length of Arm 3 ft. 5 in.
One Traveling Head

Address

INGERSOLL-RAND COMPANY
11 Broadway, New York, N. Y.

Stating full particulars and selling price

WANTED

MODERN LATHE

1—36-in. or 42-in., not less than 16-ft. between centers.

SHARTLE BROS. MACHINE CO.
Middletown, Ohio

WANTED

SECOND HAND

60-in. or larger Heavy Lathe
14-ft. or 16-ft. Boring Mill

STEACY-SCHMIDT MFG. CO., York, Pa.

WANTED—FIFTY TON

HYDRAULIC CLAW JACK

12-Inch Rise
Give Full Particulars

Address—PURCHASING AGENT
P. O. Box 989, Buffalo, N. Y.

WANTED

TRIMMING PRESS

Similar dimensions to No. 93 Toledo Press. Should have at least 4-in. stroke, 36 in. between housings and have side cut-off, belt driven.

McKinnon Industries, Ltd.
St. Catherines, Canada

WANTED

Brown & Sharpe Automatics

10—00—serial numbers 5500 up
5— 0—serial numbers 3500 up

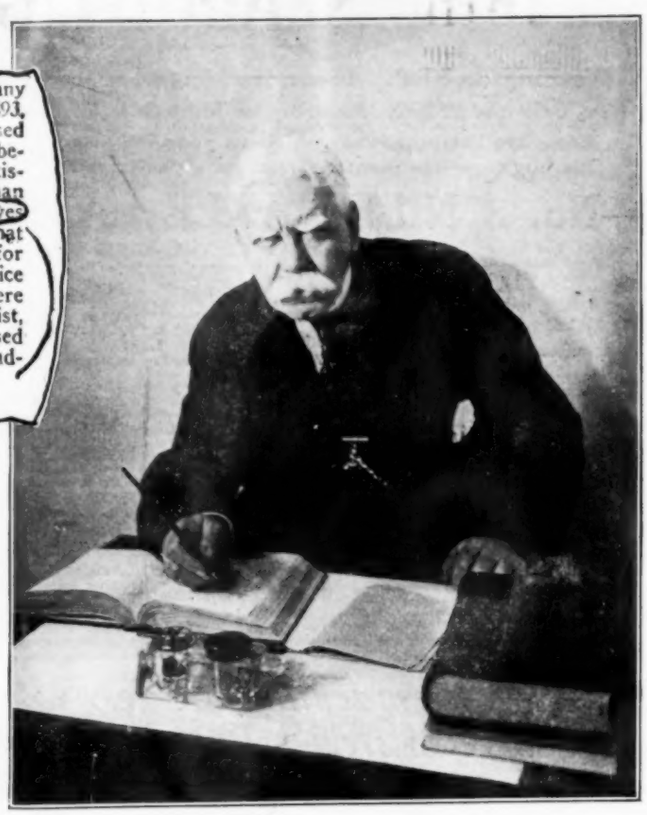
Advise serial number and price

W28—American Machinist,
10th Ave. at 36th St., New York City

Get your Wants

into the Searchlight

The [redacted] Company has been in business since 1893, and has devoted itself to the used electric motor trade from the beginning. It does more advertising when business is dull than when it is active, but it believes in advertising all the time. That it has found that advertising for prestige pays, in a line where price is supposed to govern, and where good will is not supposed to exist, shows the possibilities of the used machinery field from the standpoint of advertising.



Can I afford not to advertise?

Can I *afford* to cut down my publicity because business is dull?

Can I *afford* to ignore the policy that has PAID my competitors?

Can I *afford* to let the field think that dull times have put *me* out of business?

Can I *afford* to let buyers or sellers think that my company is less able to render service?

Can I *afford* to have my business misjudged by the wrongful impression of small advertising space, perfunctory copy, dry-as-dust listings?

Can I *afford* to have become forgotten when business picks up again?

What's the answer, Mr. Dealer?

Build Bigger Business by steady advertising

O160

AMERICAN MACHINIST

Think "SEARCHLIGHT" First

ADVERTISING RATES

POSITIONS VACANT—Business Opportunities and other undisplayed ads, 8 cents a word, minimum $2.00 an insertion.

POSITIONS WANTED—Evening work wanted, tutoring and other undisplayed ads of individuals looking for employment, 4 cents a word, minimum 75 cents, payable in advance.

ADD 5 WORDS for box number in undisplayed ads if replies are to any of our offices. There is no extra charge for forwarding replies.

DISCOUNT OF 10% if one payment is made in advance for 4 consecutive insertions of undisplayed ad.

ADS IN DISPLAY TYPE—Space is sold by the inch (30 in. to a page), the price depending upon total space used within a year, some space to be used each issue.

RATE PER INCH for ads in display space:

1 to 3 in., $5.00 an in.	15 to 29 in., $4.50 an in.
4 to 7 in., $4.80 an in.	30 to 49 in., $4.40 an in.
8 to 14 in., $4.60 an in.	50 to 99 in., $4.20 an in.

POSITIONS VACANT — EMPLOYMENT — POSITIONS WANTED

POSITIONS VACANT

Canada

DIE SINKER wanted; first-class man only; best working conditions and top wages. Apply Employment Manager, McKinnon Industries, Ltd., St. Catharines, Ontario.

MAN wanted to set up and take charge of Gleason Straight Tooth Gear Cutters. Must be able to handle men; salary commensurate with ability and experience. Apply Employment Manager, McKinnon Industries, Ltd., St. Catharines, Ont.

Connecticut

FIRST-CLASS diemaker wanted, experienced on blanking and forming dies for sheet metal. Only first-class men need apply. The Excelsior Hardware Co., Stamford, Conn.

Indiana

EXPERIENCED methods men wanted, with good knowledge of machine shop practice and time study work. S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

COMPETENT production man wanted as superintendent shop, making small machine products in quantity. Write at once, stating qualifications, references and salary. Tractor-Train Co. of Ind., Connersville, Indiana.

Massachusetts

EXPERIENCED designer of power pumping machinery wanted. In reply state age, experience and compensation required. Address Employment Office, Deane Works, Holyoke, Mass.

In Replying to "Blind" Ads

number in the ad and also local address be careful to put on envelope the key of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendations or other papers of value should not be enclosed to unknown correspondents — send copies.

POSITIONS VACANT

FIRST-CLASS machinist wanted, accustomed to making steel stamping and forming dies. Excellent wages to the right man. Bay State Metal Wheel Co., East Templeton, Mass.

Michigan

CHEMIST for iron foundry wanted: Man who also has some knowledge of the non-ferrous metals preferred. P-12, Am. Mach., Leader-News Bldg., Cleveland.

New York

WE have permanent positions for bench hands and all-around machinists. Apply by letter to the American Assembling Machine Co., Croton Falls, N. Y.

MACHINE foreman for shop employing 25 men. State age, experience in full and salary desired. Universal Road Machinery Co., Kingston, N. Y.

POSITIONS VACANT

TIME study man wanted by a large up-to-date concern near New York, a practical man, thoroughly experienced in standard machine tool practice, to supervise the studying of various operations in the manufacture of small interchangeable parts and the setting of piece and bonus tasks on same. To consider your application it must contain your age, married or single, salary expected to start, and a full description of your previous experience. P-16 Amer. Mach.

DESIGNER for die castings and dies; fine opportunity for man with experience. Firm located in Greater New York. P-29, Am. Mach.

PRODUCTION foreman wanted; must be good estimator on automatics and lathe work; ambitious and capable man will have splendid opportunity. P-37, Amer. Mach.

TIME STUDY MEN—Several men experienced in taking time studies on operations in machine shop wanted by large machine shop in Greater New York; men who have had practical machine shop or toolroom experience preferred. Write Z. V., 209 Cable Building, New York.

YOUNG man wanted with a knowledge of and experience in taking time studies for rate fixing; mechanical experience preferred; state experience and salary expected in first letter. P-41, Amer. Mach., Real Estate Trust Bldg., Philadelphia.

EXPERIENCED machine tool salesman wanted for Western New York. Excellent opportunity for a man who knows the machine tool business and who will apply energy and intelligence. State age, experience and salary desired. P-71, American Machinist.

LIVE foreman wanted with pep and precision to take charge of department assembling light electrical apparatus. P-85, Am. Mach.

TOOL *and* DIEMAKERS

Men that can qualify on high grade work at top notch wages. None others need apply, or write to

The General Phonograph Mfg. Co.
Elyria, Ohio

WANTED

Draftsmen

DRAWING METAL NOVELTIES

Steady work and good wages; state experience and salary expected.

ENTERPRISE MFG. CO.
Akron, Ohio
Established Over 40 Years

WANTED

A Young, Well-Trained Ambitious Engineer

To act as instructor in Estimating, Practical Mathematics, Strength of Materials, in a technical school near Boston. From two to four years experience after graduation from college required. Some teaching experience desirable but not essential. An excellent opening with superior chances of advancement for the right young man. Please apply describing in detail age, nationality, general education and technical training and experience. Address Professor of Engineering, P. O. Box 3616, Boston, Mass.

POSITIONS VACANT

MACHINIST and lathe hands, also assemblers of complicated electrical recording instruments. Wilson-Maenhen Co., Concord Ave. and E. 143d St., Bronx.

Ohio

A THOROUGHLY practical turret lathe operating instructor wanted with practical experience in tooling and set-up. Excellent opportunity in shop of large turret lathe manufacturer located in Middle West. State experience, and salary expected. P-598, Amer. Mach., Leader-News Bldg., Cleveland.

ASSISTANT foreman wanted for machine shop employing 90 hands; must be familiar with modern manufacturing methods on drill presses, milling machines and automatic screw machines; someone familiar with instrument work preferred; Good opportunity for right party. In answering state experience and salary desired. P-74, Am. Mach., Leader-News Bldg., Cleveland.

FOREMAN wanted to take charge of tool room and machine repairs; thirty men; must possess wide experience as a producer of accurate work and must be a successful handler of men; state in your first letter education, age, nationality, experience in detail, salary expected and when available; replies held in strictest confidence. P-78, American Machinist, Leader-News Bldg., Cleveland.

FOREMAN for automatic screw machine dept. wanted; must be an executive capable of handling men and getting quantity production on automobile specialty parts; Acme, Gridley, Cleveland and Brown & Sharpe machines operated. A progressive concern that will pay for results. Give full details concerning yourself and your ability in your first letter. P-79, American Machinist, Leader-News Bldg., Cleveland.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents — send copies.

POSITIONS VACANT

Pennsylvania

LATHE HANDS wanted, men who are experienced on finished gun work on big machines; must be first-class men; a permanent position at high wages is offered. Apply in person or by letter to A. B. Wadleigh, Midvale Steel and Ordnance Company, Nicetown Works, Philadelphia, Pa.

Virginia

POSITIONS open for a number of skilled machinists, lathe, planer, shaper, milling machine and grinder operators, tool makers and assemblers who are seeking a home in an excellent community. For the right men, permanent employment in the beautiful Roanoke Valley. Superior educational advantages and a healthful climate. Modern up-to-date shop manufacturing cigarette machinery. "Open shop." For particulars write Comas Cigarette Machine Company, Salem, Virginia.

POSITIONS VACANT

West Virginia

MECHANICAL draftsmen with good experience wanted. Fairmont Mining Machinery Co., Fairmont, W. Va.

Wisconsin

TOOLMAKERS, first class, on jig and fixtures, punch and die work; excellent working conditions. Samson Tractor Co., Janesville, Wis.

EMPLOYMENT AGENCIES

CHIEF tool designers and machinery draftsmen required for placement among employers in the Middle East and Great Lakes States. Salaries of $175 and up are offered. National correspondence service at your command; we assume preliminary expenses. General Engineering Agency, Pittsburgh, Pa.

Employment Service

EXECUTIVES qualified for salaries of $2,500 to $25,000 and upwards, are invited to communicate in strict confidence with the undersigned, who will conduct preliminary negotiations for such positions. The procedure used is peculiar to this service, differing essentially from all others, and is constructive and initiative, applied individually, and in no way jeopardizing present connections. Established 1910. Send name and address only for particulars. R. W. Bixby, Inc., 307 Lockwood Building, Buffalo, New York.

YOU SHOULD INVESTIGATE!

High grade men are needed in a new, modern and up-to-date $15,000,000 automobile plant.

Unusual opportunities are here for men who are interested, not only in their present, but in their future connections.

Good pay—Vacations—Life Insurance—Anniversary Checks—A chance to own your own home—are additional reasons for coming with us.

WE WANT

General Foremen
Department Foremen
Special Mechanical Men
Tool Makers
Die Sinkers
Skilled Help

Make your applications or requests for interview in writing and address correspondence to

Employment Department

The Studebaker Corporation
South Bend, Ind.

WANTED

Thoroughly Competent Mechanic

between 30 and 50 years of age, for Master Mechanic to take charge of machine shop and press room of large shop manufacturing household utensils.

Must be experienced designer of tools for this manufacture in steel and aluminum.

Give full confidential details of past experience with references in first letter—also state salary expected.

P46—American Machinist
10th Ave. at 36th St., New York City

HIGH-GRADE MEN

find our Confidential Advertising Service extremely satisfactory. Let us, by correspondence, confidentially negotiate for you suitable positions with proper employers Your name is never mentioned—everthing strictly confidential. Write for details of our system.

THE NATIONAL BUSINESS BOURSE
Association Bldg., Chicago

CAPABLE TOOL DESIGNERS

wanted for Punch and Die, Gauge and Fixture Work. Opportunity for right man to become *Head of Department.*

Peters-Morse Manufacturing Corp'n
Employment Department
Ithaca, N. Y.

TRACER AND DETAILER WANTED

Man to do tracing and detailing. Must be capable of making neat tracings with vertical lettering. Permanent position with old well established company.

State age, married or single, education, salary desired, and send sample of work with application. Give complete outline of your experience. Location—Pennsylvania.

P58—American Machinist
10th Ave. at 36th St., New York City

POSITIONS WANTED

Connecticut

SUPERINTENDENT or general foreman, executive and initiative ability, practical mechanic, machine tools, general machinery; alert on new ideas. PW-33, Am. Mach.

GENERAL superintendent desires to change; capable of taking charge of entire plant, equipping and organizing to show results; experience covers manufacturing light and medium machinery, tools, dies, electrical and mechanical supplies of high-grade interchangeable parts. Best references; inquiries treated confidentially. PW-48, Amer. Mach.

MECHANICAL superintendent, 18 years' experience in designing, maintenance and construction; good executive and thoroughly familiar with modern efficiency methods. PW-47, Amer. Mach.

Illinois

MECHANICAL engineer; 9 years on design and methods. Address Box 170, Moline, Ill.

MECHANICAL engineer; graduate; 10 years on manufacturing methods, design and patents; present salary $3,300.00. Address PW-61, Amer. Mach., Old Colony Bldg., Chicago.

Indiana

WORKS manager or general superintendent, high grade man of broad experience with large organizations open for engagement after June 30th; active and progressive executive with successful record in handling help, practical knowledge of up-to-date manufacturing in all of its branches; now employed as works manager of factory employing 600 men; married; nationality, American; age, 36. PW-76, Am. Mach., Old Colony Bldg., Chicago.

Michigan

TIME STUDY engineer, age 30, open for engagement, executive connection only; location immaterial. PW-10, Am. Mach., Leader-News Bldg., Cleveland.

COMPETENT manufacturing or production manager would like to hear from those needing a thoroughly trained executive. Available July first. PW-68 American Machinist.

SUPERINTENDENT, experienced in light and medium interchangeable manufacture; broad knowledge of modern methods of planning, routing and purchases; specialized in tool design, brass and iron foundry practice and metal finishing; age 35; American; location, New York City or vicinity; gen. sup't of plant employing 250 men at present; can give the best of references. PW-83, Am. Mach., Leader-News Bldg., Cleveland.

Minnesota

GENERAL foreman or superintendent, a thorough mechanic, age 32, 16 years' practical shop experience; last 5 years in charge of building printing presses and special machinery; can cut out unnecessary operations and reduce cost; good organizer; available July 1; $3,000 per annum; best of reference. Address A. Reynolds, 522 N. Main Street, Stillwater, Minn.

New Hampshire

MR. MANUFACTURER: Have you a place in your organization for a first-class, all-around mechanic, one who has worked 10 years in the shop and 8 years in the engineering department, designing jigs, fixtures and special machinery; one who understands processing, time study and the most modern shop practices and has a good technical training; age 35; married; an associate member of A. S. M. E. and now holding responsible position; best references. PW-54, Amer. Mach.

New Jersey

MECHANICAL engineer, designer of automatic machinery and tools for quantity production, specialist on printing and paper product machinery, open for engagement. PW-6, Am. Mach.

PRACTICAL mechanic (tool, die and machine man), with several years' experience as tool and production foreman; also assistant manager, would like a position with growing concern where every move counts; age 35; experience 20 years. PW-52, Amer. Mach.

MECHANICAL and electrical engineer, technically trained and experienced, wants position as assistant to manager or as head of a department in large works. PW-75, Am. Mach.

New York

PATENT engineer, able mechanical engineer and patent attorney with varied experience, now available. Benjamins, 72 Grand Ave., Brooklyn.

ENGINEER designer on special machine tools, medium and heavy turning and boring, planing, grinding, various types of milling, slabbing, gear cutting and automatic machinery, etc. Open for executive position to take charge of engineering organization. Correspondence solicited. PW-772, Amer. Mach.

YOUNG man with eight years' practical shop experience, three years an executive, and two years selling experience desires to make connection with reliable concern either in executive capacity or selling high-grade production tools and equipment. PW-42, Amer. Mach.

DESIGNER and toolmaker, technical education, with executive and estimating ability, desires employment with a live firm manufacturing typewriters, adding machines, cash registers, etc. Ten years practical experience, age 31 years; at present in charge of Gauge Inspection. Middle West preferred. PW-67, Amer. Mach.

PRODUCTION manager or industrial engineer; technical graduate, associate member in American Society of Mechanical Engineers; six years experience in practical shop work as machinist and tool maker, eleven years direct experience in shop management and production control; familiar and experienced in efficient employment factors, incentives to workmen, suggestions and co-operation with workmen, production forms, planning, routing, time study, scheduling, dispatching, inspection, factory costs, control boards, machine tools and design of tools, dies, jigs and fixtures; have worked for some of the most modern plants in the country; age 35; at present employed as production manager; desire change. PW-60, Am. Mach.

EXECUTIVE'S assistant, technical graduate, age 28, married, expert structural and mechanical draftsman, estimator, office administration, accountancy and systematizer desires responsible position in New York City or immediate vicinity. PW-73, Am. Mach.

GRADUATE mechanical engineer, 28, desires to get into the sales department of a manufacturing concern. PW-86, Am. Mach.

MANUFACTURING executive; graduate mechanical engineer with broad experience in factory management, handling of men and organizing production; location, New York City or immediate vicinity. PW-72, Am. Mach.

Ohio

AM 30 years of age and have been a rover, am married now and want to settle down and make something of myself. Am a practical mechanic, tool-maker and designer. Have held such positions as chief tool designer, assitsant methods engineer and assistant master mechanic in automobile and tractor plants. Can plan methods, machinery and tools for production and get results. Can you use me? Box No. 225, Central Station, Toledo, O.

SUPERINTENDENT; energetic, can get production cheerfully in highly competitive lines, estimating, designing, tools, dies, machinery, foundry; never failed to surpass expectations; several times built up net monthly earnings over $12,000 with 200 hands; production my specialty. PW-77, Amer. Mach.

TECHNICAL graduate with four years' practical experience desires position in sales or engineering work; location not restricted; can you use him? PW-84, Am. Mach., Leader-News Bldg., Cleveland.

WORKS manager wants position with progressive manufacturing firm where exists an opportunity to apply scientific methods of management and production control based upon common sense and practical achievement. Experienced in manufacturing articles requiring interchangeability of component parts. Possessing the natural qualifications of an executive and an excellent reputation as a mechanical and industrial engineer. PW-69, American Machinist, Leader-News Bldg., Cleveland.

Pennsylvania

MAINTENANCE engineer, or master mechanic, wide experience in textile, jute cordage and general machine shop work, open for position July 1; desires position in industrial plant. Philadelphia and vicinity preferred. PW-19 Amer. Mach., Real Estate Trust Bldg., Philadelphia.

Wisconsin

MECHANICAL engineer, wide experience in tools and machine design and building, especially automotive as motors and tractors, etc.; first-class man—as works engineer, production man, master mechanic or similar position; age 35; married; salary not less than $4,500 yearly. PW-53, Amer. Mach., Old Colony Bldg., Chicago.

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PATENT ATTORNEYS

PATENTS, C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

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On Friday, July 9, 1920, at 11 A. M.

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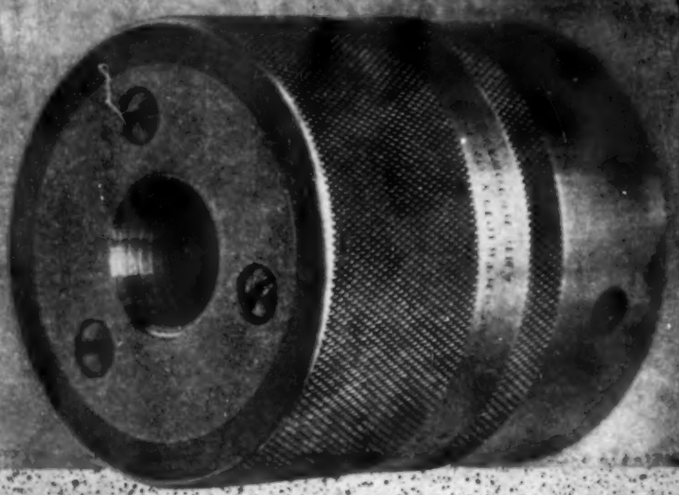

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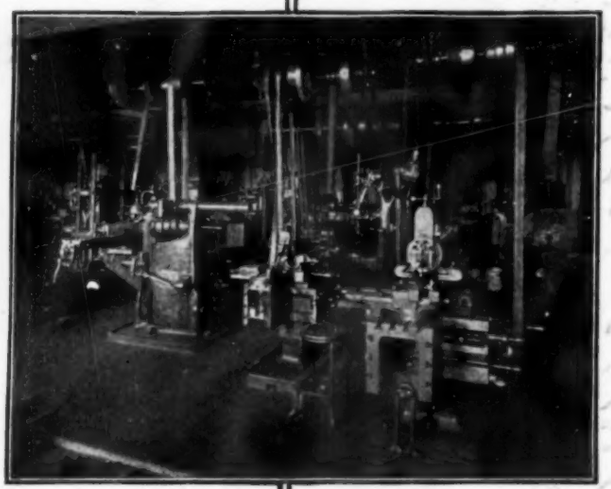

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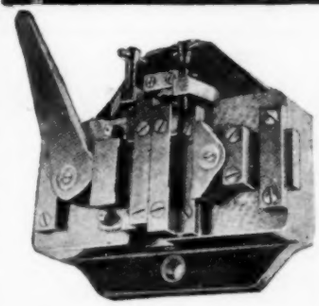

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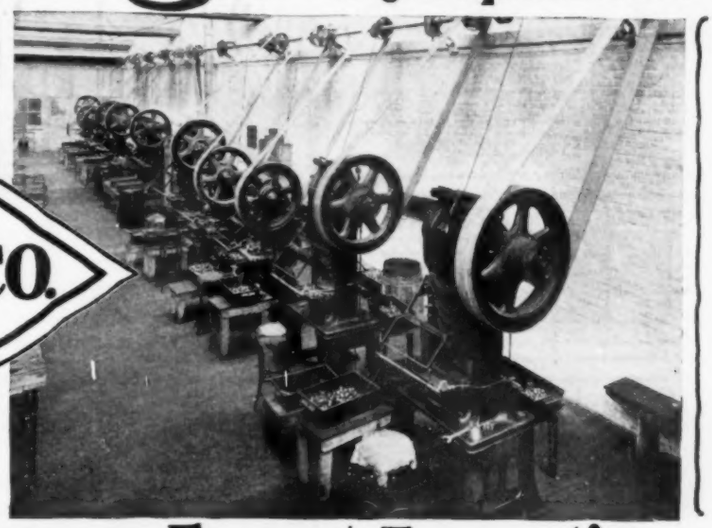

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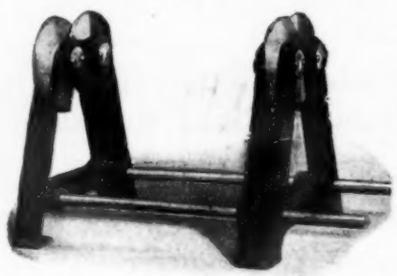

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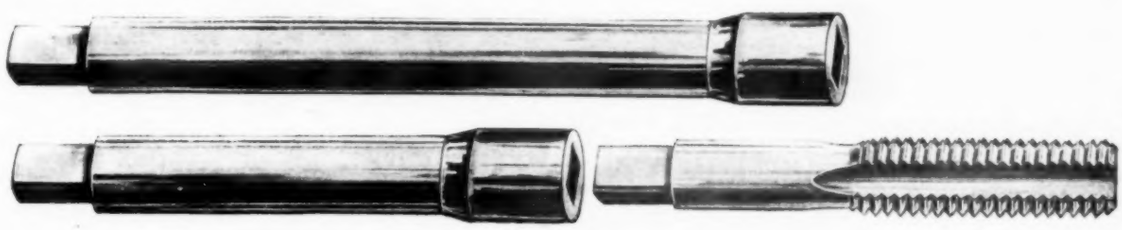


Allen Tap Extensions

Make any tap a pulley tap

ALLEN Tap Extensions do the work of a pulley tap, with an adaptability to *any* job that no long-shank tap can afford. They cost less than pulley taps, and save the expense of replacements due to breakage of the special long shanks. Set consists of two pieces: 4 inches and 6 inches long respectively (10 inches in combination). Experience proves these lengths to be the most practical and suitable for all-round use.

The sockets are formed by the Allen process of cold-drawing, which increases the density of the steel around the socket-hole, and adds to its strength 30%. The squares and socket openings conform to the standard used generally by leading tap manufacturers, and where some makes have shanks with squares slightly larger than this standard, they may be ground to fit. Lis s of sizes, with prices, will be sent on request; *immediate delivery assured.*

The ALLEN MFG. COMPANY, 129 Sheldon St., HARTFORD, CONN.

Exclusive manufacturers of Safety Set Screws, Socket Head Cap Screws and Tap Extensions—Allen process

Pacific Coast Branch Office: The Charles A. Dowd Sales Co., 320 Market St., San Francisco, Calif.

WHAT AND WHERE TO BUY

A Classified Index of Advertisers in This Issue

For Alphabetical Index See Last Page

Abrasive Discs
Badger Tool Co., Beloit, Wis.
Besly & Co., Chas. H., Chicago
Carborundum Co., Niagara Falls
Gardner Machine Co., Beloit

Abrasive Materials
Carborundum Co., Niagara Falls
Cutter & Wood Sup. Co., Boston
Dickinson, Thos. L., N. Y.
Gardner Machine Co., Beloit
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grind. Wheel Corp., Chester
Norton Co., Worcester
Safety Emery Wheel Co., Springfield, O.
Vitrified Wheel Co., Westfield

Accumulators, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Air Lifts
Ingersoll-Rand Co., N. Y.
Sullivan Machinery Co., Chicago.

Analyses, Chemical
Souther Eng. Corp., Hy., Hartford

Angle Plates
Boston Scale & Mach. Co., Boston
Taft-Peirce Mfg. Co., Woonsocket

Anvils
West Steel Cast. Co., Cleveland

Arbors
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cochrane-Bly Co., Rochester
Cushman Chuck Co., Hartford
Detroit Twist Drill Co., Detroit
Lincoln Twist Drill Co., Taunton
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit.
Nicholson & Co., W. H., Wilkes-Barre
Standard Eng. Wks., Pawtucket
Taft-Peirce Mfg. Co., Woonsocket
Union Mfg. Co., New Britain
Whitney Mfg. Co., Hartford

Babbitt Metal
Ajax Metal Co., Philadelphia
Williams & Son, E. A., Jersey City

Balancing Machines
Norton Co., Worcester

Balancing Ways
Anderson Bros. Mfg. Co., Rockford

Ball Retainers
Bearings Co. of America, Lancaster

Balls, Brass, Bronze and Steel
Abbott Ball Co., Hartford
Auburn Ball Bearing Co., Rochester
Boker & Co., H., N. Y.
Gwilliam Co., N. Y.
New Departure Mfg. Co., Bristol

Barrels, Tumbling
Abbott Ball Co, Hartford
Royersford Fdry. & Mch. Co., Royersford
Whiting Fdry. Equip. Co., Harvey

Bars, Boring
Gisholt Machine Co., Madison
Herbert, Alfred, N. Y.
Marvin & Casler Co., Canastota
Pedrick Tool & Mach. Co., Phila.
Underwood Corp., H. B., Phila.

Bars, Bronze Cored
American Bronze Corp., Berwyn
Bunting Brass & Bronze Co., Toledo
Williams & Son, E. A., Jersey City

Bearings, Ball
Auburn Ball Bearing Co., Rochester
Bearings Co. of America, Lancaster
Fafnir Bearing Co., New Britain
Federal Bearings Co., N. Y.
Gurney Ball Bearing Co., Jamestown
Gwilliam Co., N. Y.
New Departure Mfg. Co., Bristol
Norma Co. of America, N. Y.
Schatz Mfg. Co. Poughkeepsie
S K F Industries, Hartford
Transmission Ball Bearing Co., Buffalo
U. S. Ball Bearing Co., Chicago

Bearings, Bronze
America Bronze Corp., Berwyn
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn
Williams & Son, E. A., Jersey City

Bearings, Die-Cast
Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse
Light Mfg. & Fdry. Co., Pittsburgh

Bearings, Journal
Ajax Metal Co., Philadelphia
American Bronze Corp., Berwyn
Arguto Oil Bearing Co., Phila.
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus
Hart Roller Bearing Co., Orange
Laminated Shim Co., N. Y.
Mass. Oil Bearing Co., Worcester
Williams & Son, E. A., Jersey City

Bearings, Roller
Gwilliam Co., N. Y.
Hart Roller Bearing Co., Orange
Hyatt Roller Bearing Co., N. Y.
Norma Co. of America, N. Y.
Royersford Fdry. & Mch. Co., Royersford

Belt Cement
Graton & Knight Mfg. Co., Worcester
Ladew Co., Edw. R., N. Y.
Schieren Co., Chas. A., N. Y.

Belt Clamps
Crescent Belt Fastener Co., N. Y.
Hoggson & Pettis Mfg. Co., New Haven

Belt Dressings and Fillers
Graton & Knight Mfg. Co., Worcester
Ladew Co., Edw. R., N. Y.
Schieren Co., Chas. A., N. Y.
Texas Co., N. Y.
White & Bagley Co., Worcester

Belt Fasteners
Bristol Co., Waterbury
Crescent Belt Fastener Co., N. Y.

Belt Lacing
Chicago Rawhide Mfg. Co., Chicago
Graton & Knight, Worcester
Ladew Co., Edw. R., N. Y.
Schieren Co., Chas. A., N. Y.

Belt Lacing Machines
Birdsboro Steel F. & M. Co., Birdsboro
Crescent Belt Fastener Co., N. Y.

Belt Shifters
LeBlond Mach. Tool Co., R. K., Cincinnati

Belting, Chain
Link-Belt Co., Chicago, Phila.
Morse Chain Co., Ithaca
Whitney Mfg. Co., Hartford

Belting, Endless
Brown Mfg. Co., Arthur H., Tilton

Belting, Fabric
Rossendale-Reddaway B. & H. Co., Newark

Belting, Leather
Chicago Rawhide Mfg. Co., Chicago
Graton & Knight Mfg. Co., Worcester
Ladew Co., Edw. R., N. Y.
New York Belting Co., Worcester
Schieren Co., Chas. A., N. Y.

Belts, Abrasive
Production Mach. Co., Greenfield

Bench Countershaft Standards
New Britain Mch. Co., New Britain

Bench Drawers
New Britain Mch. Co., New Britain

Benches, Work
Manufacturing Equip. & Eng. Co., Framingham
New Britain Mch. Co., New Britain
Western Tool & Mfg. Co., Springfield, O.

Bench Legs
Brown & Sharpe Mfg. Co., Providence
Garwood, B. & I. Wks., Garwood
Manufacturing Equip. & Eng. Co., Framingham
New Britain Mch. Co., New Britain

Bending Machines, Power
Baird Pneu. Tool Co., Kansas City
Cleveland (O.) Punch & Shear Wks.
Hilles & Jones Co., Wilmington
Niles-Bement-Pond Co., N. Y.
Toledo Mach. & Tool Co., Toledo

Blocks
Simplex Tool Co., Woonsocket
Taft-Peirce Mfg. Co., Woonsocket

Blocks, Chain (See Hoists, Hand)

Blocks, Die
Halcomb Steel Co., Syracuse

Blocks, Pillow
Gurney Ball Bearing Co., Jamestown

Blowers
American Gas Furnace Co., N. Y.
Chicago Flex. Shaft Co., Chicago
Eclipse Fuel Eng. Co., Rockford
General Electric Co., Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Blueprinting Machinery
Buckeye Engine Co., Salem
Wickes Bros., Saginaw

Blueprints
Wickes Bros., Saginaw

Bolt & Nut Machinery
Acme Mchy. Co., Cleveland
Greenfield T. & D. Corp., Greenfield
Landis Machine Co., Waynesboro
National Machinery Co., Tiffin
Universal Mch. Co., Bowling Green
Victor Tool Co., Waynesboro

Bolts & Nuts
National Acme Co., Cleveland

Books, Technical
McGraw-Hill Book Co., N. Y.

Boosters
Crocker & Wheeler Co., Ampere
General Electric Co., Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Boring and Turning Mills, Vertical
Betts Machine Co., Rochester
Bickford & Co., H., Lakeport
Bullard Mach. Tool Co., Bridgeport
Cincinnati Planer Co., Cincinnati
Colburn Mach. Tool Co., Franklin
Gisholt Machine Co., Madison
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Sellers & Co., Wm., Philadelphia

Boring, Drilling and Milling Machines, Horizontal
Barnes Co., W. F. & John., Rockford
Beaman & Smith Co., Providence
Betts Mach. Co., Rochester
Cleveland (O.) Mch. Tool Co.
Coats Mach. Tool Co., N. Y.
Dale-Brewster Mach. Co., Chicago
Defiance Mach. Works, Defiance
Gidding & Lewis M. T. Co., Fond du Lac
Gisholt Machine Co., Madison
Hoefer Mfg. Co., Freeport
Landis Tool Co., Waynesboro
Lucas Mach. Tool Co., Cleveland
Moline Tool Co., Moline
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Pawling & Harnischfeger Co., Milwaukee
Pedrick Tool & Mach. Co., Phila.
Rockford Drilling Mch. Co., Rockford
Sellers & Co., Wm., Philadelphia
Springfield Mach. Tool Co., Springfield, O.
Universal Boring Mach. Co., Hudson
Vandyck Churchill Co., N. Y.

Boring, Drilling and Milling Mach., Vertical
Betts Machine Co., Rochester
Cochrane-Bly Co., Rochester

Boring Heads
Davis Boring Tool Co., St. Louis
Marvin & Casler Co., Canastota
Taft-Peirce Mfg. Co., Woonsocket

Boring Tools
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Davis Boring Tool Co., St. Louis
Independent Pneu. T. Co., Chicago
Kelly Reamer Co., Cleveland
Lovejoy Tool Co., Springfield
Taft-Peirce Mfg. Co., Woonsocket
Union Tool Co., Orange
Western Tool & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn

Boxes, Tote (See Furniture, Machine Shop)

Broaches
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson
Taft-Peirce Mfg. Co., Woonsocket

Broaching Machines
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson

Bronze
Ajax Metal Co., Philadelphia
American Bronze Corp., Berwyn
Bunting Brass & Bronze Co., Toledo
Lumen Bearig Co., Buffalo
Williams & Son, E. A., Jersey City

Bronze, Phosphor
Ajax Metal Co., Philadelphia
Bunting Brass & Bronze Co., Toledo
Phosphor Bronze Smelt. Co., Phila.

Bucket Carriers, Pivoted
Link-Belt Co., Chicago, Phila.

Buffing or Polishing Machines (See Polishing and Buffing Machines)

Bulldozers
Toledo Mach. & Tool Co., Toledo

Burners, Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
Baird Pneu. Tool Co., Kansas City
Best, W. N., N. Y.
Johnson Gas Appliance Co., Cedar Rapids
Tate Jones & Co., Pittsburgh

Bushings
American Bronze Corp., Berwyn
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus
Lumen Bearing Co., Buffalo
Sterling Specialty Co., Newcomerstown
Williams & Sons, E. A., Jersey City

Cabinets, Tool
Armstrong Bros. T. Co., Chicago

Calipers
Athol Mach. Co., Athol
Brown & Sharpe Mfg. Co., Providence
Horstmann Co., F. W., Irvington
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol
Union Tool Co., Orange

Cam Cutting Machines
Cochrane-Bly Co., Rochester
Garvin Machine Co., N. Y.
Rowbottom Mach. Co., Waterbury
Taft-Peirce Mfg. Co., Woonsocket

Cams
Rowbottom Mach. Co., Waterbury

Can-Making Machinery (See Sheet Metal Working Machinery)

Castings, Aluminum
Acme Die Cast Corp., Brooklyn
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn
Light Mfg. & Fdry. Co., Pottstown
Stewart Mfg. Corp., Chicago

Castings, Brass and Bronze
Ajax Metal Co., Philadelphia
American Bronze Corp., Berwyn
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus
Doehler Die Cast. Co., Brooklyn
Imperial Brass & Mfg. Co., Chicago
Light Mfg. & Fdry. Co., Pottstown
Lumen Bearing Co., Buffalo.
Pangborn Corp., Hagerstown
Stewart Mfg. Corp., Chicago
Williams & Son, E. A., Jersey City

Castings, Die Molded
Acme Die Cast. Corp., Brooklyn
Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse
Light Mfg. & Fdry. Co., Pottstown
Lumen Bearing Co., Buffalo
National Lead Co., N. Y.
Stewart Mfg. Corp., Chicago

Castings, Iron
Athol Machine Co., Athol
Birdsboro Steel F. & M. Co., Birdsboro
Brady Fdry. Co., Jas. A., Chicago
Brown & Sharpe Mfg Co., Providence
Caldwell & Son Co., H. W., Chicago
Chisholm-Moore Mfg. Co., Cleveland
Franklin Mach. Co., Providence
Hilles & Jones Co., Wilmington
Munson, E. G., Utica
Springfield Mch. Tool Co., Springfield, O.
Whitcomb-Blaisdell Mach. Tool Co., Worcester

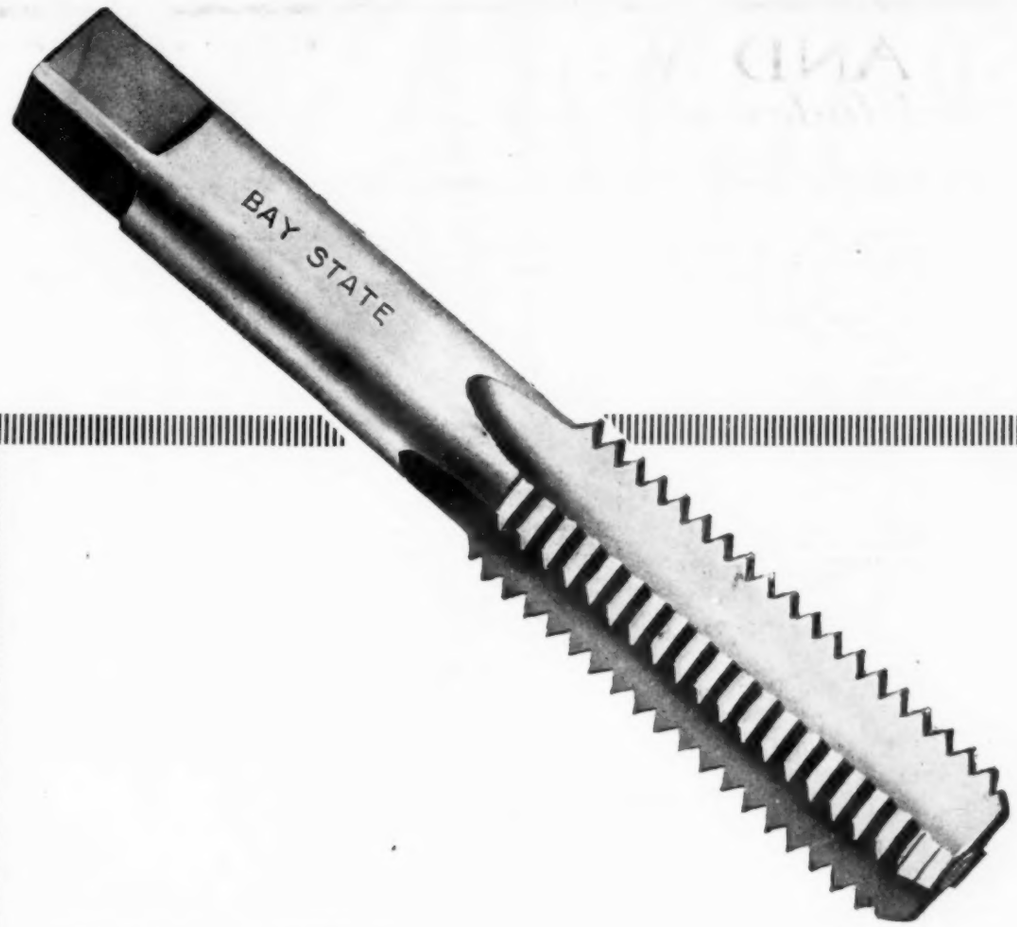
Castings, Nichrome
Driver-Harris Co., Harrison

Castings, Semi-Steel
Hilles & Jones Co., Wilmington
Pangborn Corp., Hagerstown
Springfield Mch. Tool Co., Springfield, O.
West Steel Cast. Co., Cleveland, O.

Cements, Iron
Hilo Varnish Corp., Brooklyn
Smooth-On Mfg. Co., Jersey City

Centering Machines
Cadillac Tool Co., Detroit
Hendey Mach. Co., Torrington
Niles-Bement-Pond Co., N. Y.
Standard Eng. Wks., Pawtucket
Whiton Mch. Co., D. E., New London

Centers, Latch
Kell-Hock Sales Co., Newark



TESTS

speak louder than

WORDS

Test out Bay State Taps or Dies against other taps or dies on the same piece of steel.

Which tap or die wins from the standpoint of accuracy, speed and all-round tool efficiency?

Tests speak louder than any shouting we can do for them.

Take us up on this proposition. We'll win.

Bay State Tap & Die Company

Mansfield, Massachusetts

Centers, Planer
Cincinnati Planer Co., Cincinnati
Morse Twist D. & M. Co., New Bedford
Woodward & Powell Planer Co., Worcester

Chains (See Sprockets and Chains)

Chains, Driving
Baldwin Chain & Mfg. Co., Worcester
Boston Gear Wks., Norfolk Downs.
Link-Belt Co., Phila., Chicago
Morse Chain Co., Ithaca
Whitney Mfg. Co., Hartford

Chasers
Bay State Tap & Die Co., Mansfield

Chemists
Souther Eng. Corp., Hy., Hartford

Chucking Machines
Brown & Sharpe Mfg. Co., Providence
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Cleveland (O.) Auto Mach. Co.
Gisholt Mach. Co., Madison
Jones & Lamson Mach. Co., Springfield, Vt.
New Britain Mch. Co., New Britain
Potter & Johnston Mch. Co., Pawtucket
Warner & Swasey Co., Cleveland

Chucks, Centering
Cushman Chuck Co., Hartford
Thomas Elevator Co., Chicago

Chucks, Drill and Tap
Almond Mfg. Co., T. R., Ashburnham
American Mach. Co., Hartford
Bicknell-Thomas Co., Greenfield
Clark Equipment Co., Buchanan
Cost-Cut Counterbore Co., Detroit
Cushman Chuck Co., Hartford.
Eastern Tube & Tool Co., Bklyn.
Hammacher, Schlemmer & Co., N. Y.
Herbert, Alfred, N. Y.
Horton & Son Co., E., Windsor Lks.
Jacobs Mfg. Co., Hartford
Jarvis Co., Chas. L., Gildersleeve.
Manufacturers Equip. Co., Chicago.
Manufacturers Mch. Products Co., Detroit
Marvin & Casler Co., Canastota.
Modern Tool Co., Erie.
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Peter Bros. Mfg. Co., Algonquin.
Pratt Chuck Co., Frankfort.
Scully-Jones Co., Chicago.
S K F Industries, Hartford.
Skinner Chuck Co., New Britain.
Standard Tool Co., Cleveland
Union Mfg. Co., New Britain.
Victor Tool Co., Waynesboro.
Wahlstrom Tool Co., Brooklyn.
Watts Bros. T. Wks., Turtle Creek
Whitney Mfg. Co., Hartford.
Whiton Mch. Co., D. E., N. London.

Chucks, Lathe
Advance Tool Co., Cincinnati.
Almond Mfg. Co., T. R., Ashburnham.
Bullard Mach. Tool Co., Bridgeport.
Cushman Chuck Co., Hartford.
Frontier Chuck & T. Co., Buffalo
Gisholt Mach. Co., Madison.
Herbert, Alfred, N. Y.
Hoggson & Pettis Mfg. Co., New Haven.
Horton & Son Co., E., Windsor Locks.
Manufacturers Equip. Co., Chicago.
Pratt Chuck Co., Frankfort.
Quick Change Chuck Mfg. Co., Dayton.
Russell Holbrook & Henderson, N. Y.
Simplex Tool Co., Woonsocket.
Skinner Chuck Co., New Britain.
Terkelsen & Wennberg, Boston.
Thomas Elevator Co., Chicago
Union Mfg. Co., New Britain.
Whiton Mch. Co., D. E., New London

Chucks, Magnetic
Churchill, Morgan, Crittsinger, Worcester.
Heald Mch. Co., Worcester.
Persons-Arter Mch. Co., Worcester.
Taft-Peirce Mfg. Co., Woonsocket.
Walker Co., O. S., Worcester.

Chucks, Planer
Cincinnati Planer Co., Cincinnati.
Hoggson & Pettis Mfg. Co., New Haven.
Horton & Son Co., E., Windsor Locks.
Skinner Chuck Co., New Britain.
Union Mfg. Co., New Britain.
Walker Co., O. S., Worcester.

Chucks, Split
Ames Co., B. C., Waltham.
Rivett Lathe & Grinder Co., Boston.
Seneca Falls Mfg. Co., Seneca Falls.
Sloan & Chace Mfg. Co., Newark.
Stark Tool Co., Waltham.
Wade-American Precision Tool Co., Boston.

Chucks, Vertical Boring Mill
Bullard Mach. Tool Co., Bridgeport
Gisholt Mach. Co., Madison.

Chucks Wrenchless
Thomas Elevator Co., Chicago

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago.
Hammacher, Schlemmer & Co., N. Y.
Reed Mfg. Co., Erie.
Starrett Co., L. S., Athol.
Williams & Co., J. H., Brooklyn.

Cleaners, Metal, Waste, General
Oakley Chemical Co., N. Y.

Clocks, Time
Gisholt Machine Co., Madison.

Clutches, Friction
Brown Co., A. & F., N. Y.
Brown Eng. Co., Reading.
Hilliard Clutch & Mchy. Co., Elmira
Johnson Mach. Co., Carlyle, Manchester.
Link-Belt Co., Chicago, Philadelphia
Moore & White Co., Phila.
Oesterlein Mach. Co., Cincinnati
Transmission Ball Bearing Co., Buffalo.

Coal and Ash Handling Machinery
Link-Belt Co., Chicago, Philadelphia
Whiting Fdry. Equip. Co., Harvey.

Coal-Storage Systems
Link-Belt Co., Chicago, Philadelphia

Coils, Electrical
General Electric Co., Schenectady.

Collars, Shaft & Set
Royersford Fdry. & Mch. Co., Royersford

Collars, Spacing
Detroit Stamping Co., Detroit.
Scully-Jones Co., Chicago.
Shepard Elect. C. & H. Co., Montana Falls

Collets
Bay State T. & D. Co., Mansfield.
Brown & Sharpe Mfg. Co., Providence.
Modern Tool Co., Erie.
Rivett Lathe & Grinder Co., Boston
Standard Eng. Wks., Pawtucket.
Union Twist Drill Co., Athol.
Whitney Mfg. Co., Hartford.

Compounds, Carburizing, Casehardening and Tempering
Bennett Co., W. R., Elmwood.
Coats Mach. Tool Co., N. Y.
Shore Instrument & Mfg. Co., N. Y.
Steel Treating Equip. Co., Detroit.

Compounds, Cleaning
Oakley Chemical Co., N. Y.

Compounds, Cutting, Drawing, Drilling, Grinding and Screw Cutting
Oakley Chemical Co., N. Y.
Texas Co., N. Y.
White & Bagley Co., Worcester.

Compounds, Pipe-Joint
Smooth-On Mfg., Jersey City.

Compressors, Air and Gas
Black & Decker Mfg. Co., Baltimore.
Bury Compressor Co., Erie.
Chicago Pneu. Tool Co., N. Y.
General Electric Co., Schenectady.
Ingersoll-Rand Co., N. Y.
Sullivan Machinery Co., Chicago.
Taylor Instrument Co., Rochester

Compressors, Electric
Black & Decker Mfg. Co., Baltimore.

Conduits, Interior
General Electric Co., Schenectady.

Cones, Friction
Evans Fric. Cone Co., Newton Highlands.

Connecting-Rods and Straps
Standard Gauge Steel Co., Beaver Falls.

Connectors, Solderless
Holtzer-Cabot Elect. Co., Boston

Contract Work
Acklin Stamping Co., Toledo.
Acme Elect. & Mfg. Co., Cleveland
American Instrument Wks., Pittsburgh.
American M. & F. Co., Brooklyn.
American T. & M. Co., Urbana.
Becker Milling Mch. Co., Hyde Park
Bicknell-Thomas Co., Greenfield.
Bishop Machine Co., N. Y.
Blair Tool & Mch. Wks., N. Y.
Boston Scale & Mach. Co., Boston.
Brady Fdry. Co., Jas. A., Chicago.
Brock, Jr., T. & M. Wks., Arthur, Phila.
Brown & Sharpe Mfg. Co., Providence.
Budd & Ranney Eng. Co., Columbus
Buffalo Pitts Co., Buffalo.
Columbus (O.) Die T. & M. Co.
Commercial Eng. Co., Cleveland.
Cotton, Inc., H. W., N. Y.
Cowdrey Mch. Wks., C. H., Fitchburg.
E. H. Machine Co., Weehawken
Emery, A. H., Glenbrook.
Frostholm Bros., Syracuse.
Garvin Mach. Co., N. Y.
Gem City Mach. Co., Dayton.
General Mach. Wks., York.
General Ordnance Co., Derby
Glenhem Embro. Co., Beacon, N. Y.
Grant Mfg. & Mch. Co., Bridgeport
Grant Tool & Gauge Co., Cleveland.
Hartford Special Mch. Co., Hartford
Hub Eng. & Mchy. Co., Bound Brk.
K-M Mfg. Co., Toledo
Lincoln Mach. Co., Pawtucket.
Lowenstein Radio Co., Brooklyn.
Marvin & Casler Co., Canastota.
Mehl Mach. T. & D. Co., Roselle
Meisel Press Mfg. Co., Boston.
Metallo Gasket Co., New Brunswick
Moback T. & M. Mfg. Co., Boston.
Modern Tool D. & M. Co., Columbus
National Mch. & Tool, Boston
New Britain Mach. Co., N. Britain.
Newton Mach. Tool Wks., Phila.
Nicholson & Co., W. H., Wilkes-Barre.
Potter T. & M. Wks., N. Y.
Premier T. & E. Design Co., B'klyn.
Rowbottom Mach. Co., Waterbury.
Service Eng. Co., N. Y.
Sheffield M. & T. Co., Dayton.
Shepherd Eng. Co., Williamsport.
Simplex Tool Co., Woonsocket.
Sloan & Chace Mfg. Co., Newark.
Steele Co., W. M., Worcester.
Taft-Peirce Mfg. Co., Woonsocket.
Tait-Marston Eng. Co., Boston
Terkelsen & Wennberg, Boston.
Union Mfg. Co., Union Hill.
Universal I. & Metal Co., Vestal
Wade-American Precision Tool Co., Boston.
Weber & Scher Mfg. Co., Newark.
Wells, J. H., N. Y.
Whiting & Comstock, Hartford.
Zarem & Rose, N. Y.

Controllers and Starters, Electric
Crocker-Wheeler Co., Ampere.
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Converters
General Electric Co., Schenectady.

Conveyors and Elevators (See Elevators)

Cotter Pins
Standard Tool Co., Cleveland

Counterbores
Advance Tool Co., Cincinnati.
Cost-Cut Counterbore Co., Detroit.
Detroit Twist Drill Co., Detroit
Manufacturers Mch. Products Co., Detroit
Moback T. & M. Mfg. Co., Boston.
National Twist D. & T. Co., Detroit
New Britain T. & Mfg. Co., New Britain.
Pratt & Whitney Co., Hartford.
Slocomb Co., J. T., Providence.

Countershafts
Brown Sharpe Mfg. Co., Providence.
Builders Iron Fdry., Providence.
Diamond Mach. Co., Providence.
Evans Fric. Cone Co., Newton Highlands.
Garvin Mach. Co., N. Y.
Norton Co., Worcester.

Countersinks
Clark Equipment Co., Buchanan.
Greenfield T. & D. Corp., Greenfield
Lincoln Twist Drill Co., Taunton.
Lindquist Eng. Wks., Portland

Counters, Revolution
Bristol Co., Waterbury.
Brown Instrument Co., Phila.
Durant Mfg. Co., Milwaukee
Veeder Mfg. Co., Hartford.

Counting Machines
Brown Instrument Co., Phila.
Durant Mfg. Co., Milwaukee
Veeder Mfg. Co., Hartford.

Counting and Printing Wheels
Doehler Die Casting Co., Brooklyn.
Franklin Die Cast. Corp., Syracuse.

Couplings, Flexible
Dexter, I. H., Goshen
Smith & Serrell, Newark

Couplings, Rigid
Smith & Serrell, Newark.

Couplings, Shaft
Almond Mfg. Co., T. R., Ashburnham.
Dexter Co., I. H., Goshen.
Johnson Mach. Co., Carlyle, Manchester.
Nicholson & Co., W. H., Wilkes-Barre.
Royersford Fdry. & Mch. Co., Royersford
Smith & Serrell, Newark.
Standard Gauge Steel Co., Beaver Falls.

Cranes, Electric
Link-Belt Co., Chicago, Philadelphia
Whiting Fdry. Equip. Co., Harvey.

Cranes, Hand (See Hoists)

Cranes, Locomotive
Link-Belt Co., Chicago, Philadelphia
Yale & Towne Mfg. Co., Stamford.

Cranes, Traveling
Canton Fdry. & Mch. Co., Canton.
Chisholm-Moore Mfg. Co., Cleveland
Fairbanks Morse Co., N. Y.
Harrington, Son & Co., Ed., Phila.
Link-Belt Co., Chicago, Phila.
Niles-Bement-Pond Co., N. Y.
Northern Eng. Wks., Detroit.
Pawling & Harnischfeger Co., Milwaukee
Shepard Elect. C. & H. Co., Montour Falls, N. Y.
Whiting Fdry. Equip. Co., Harvey.
Yale & Towne Mfg. Co., Stamford.

Crank Pin Turning Machines
Niles-Bement-Pond Co., N. Y.
Pedrick Tool & Mach. Co., Phila.
Underwood Corp., H. B., Phila.

Cupolas and Ladles
Paxson Co., J. W., Philadelphia.
Whiting Fdry. Equip. Co., Harvey.

Cut-Outs, Electrical
General Electric Co., Schenectady.
Holtzer-Cabot Elect. Co., Boston
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Cutters, Flue
Clark Equip. Co., Buchanan.

Cutters, Gear
Barber-Colman Co., Rockford.
Brown & Sharpe Mfg. Co., Providence.
Cleveland (O.) Milling Mach. Co.
Goddard Tool Co., Chicago.
National Twist D. & T. Co., Detroit
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol.

Cutters, Milling
Advance Tool Co., Cincinnati.
Barber-Colman Co., Rockford.
Becker Milling Mach. Co., Hyde Park
Bilton Mach. Tool Co., Bridgeport.
Brown & Sharpe Mfg. Co., Providence.
Cleveland (O.) Milling Mach. Co.
Cowles Tool Co., Cleveland.
Detroit Twist Drill Co., Detroit
Geometric Tool Co., New Haven.
Goddard Tool Co., Chicago.
Herbert, Alfred, N. Y.
Ingersoll Milling Mch. Co., Rockford
Lincoln T. D. Co., Taunton.
Moback T. & M. Mfg. Co., Boston.
National Tool Co., Cleveland.
National Twist D. & T. Co., Detroit
New Britain Tool & Mfg. Co., New Britain.
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford.
Reliance Steel & Tool Co., N. Y.
Standard Tool Co., Cleveland
Thurston Mfg. Co., Providence.
Union Twist Drill Co., Athol.
Whitney Mfg. Co., Hartford.

Cutters, Stay Bolt
Baird Pneu. Tool Co., Kansas City

Cutters, Thread
Rivett Lathe & Grinder Co., Boston.
Universal Mch. Co., Bowling Green

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago.
Armstrong Bros. Tool Co., Chicago.
Atkins & Co., T. C., Indianapolis.
Automatic Mach. Co., Bridgeport.
Brown & Sharpe Mfg. Co., Providence.
Coats Mach. Tool Co., N. Y.
Cochrane-Bly Co., Rochester.
Davis Mach. Tool Co., Rochester.
Earle Gear & Mach. Co., Phila.
Garvin Mach. Co., N. Y.
Gorton Mach. Co., Geo., Racine.
Greenfield T. & D. Corp., Greenfield
Herbert, Alfred, N. Y.
Hurlbut-Rogers Mchy. Co., South Sudbury.
Newton Mach. Tool Wks., Phila.
Peter Bros. Mfg. Co., Algonquin.
Vandyck Churchill Co., N. Y.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago.
Pratt & Whitney Co., Hartford.
Union Tool Co., Orange.
Western Tool & Mfg. Co., Springfield, O.

Cutting Oil Filters (See Oil Filtering Systems)

Cutting, Oxy-Acetylene
Davis-Bournonville Co., Jersey City.
Milburn Co., Alexander, Baltimore.

Dealers, Machinery (See Searchlight Section)
American Mchy. Exchange, N. Y.
American Shipb'ld'g Co., Cleveland
Barbour, Love & Woodward, N. Y.
Bath & Co., Cyril J., Cleveland.
Beal & Co., Joseph, Boston.
Bennett Mchry. Co., G. L., N. Y.
Bosworth, W. H., Cleveland.
Botwink Bros., New Haven
Brownell Mchry. Co., Providence.
Buffalo House Wreck. & Sal. Co., Buffalo.
Burroughs, Baldwin Co., N. Y.
Clifton-Pratt Co., Cincinnati.
Day Machinery Co., Buffalo.
Duff Co., J. E., N. Y.
Du Pont Chemical Co., Wilmington.
Eastern Mchry. Co., Cincinnati.
Eddy Mch. Co., E. A., Providence.

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Graves Mchy. Exchange, N. Y.
Hannan-Finton Co., Springfield.
Harris Bros. Co., Chicago.
Herbert, Alfred, N. Y.
Hill, Clarke & Co., Chicago.
Hill, Clarke & Co., Boston.
Ideal Mchy. Co., Plainsville.
Industrial Mchy. Corp., Jersey City.
Kinsey Co., E. A., Cincinnati.
Lamberg & Co., A., N. Y.
Lucas & Son, J. L., Bridgeport.
Lynd-Farquhar Co., Boston.
McMullen Mchy. Co., Grand Rapids.
Machine Tool Eng. Co., N. Y.
Maidhof & Ashton, Troy
Marshall & Huschart Mchry Co., Chicago.
Modern Mchy. Exchange, N. Y.
Morey & Co., N. Y.
Motch & Merryweather Mchy. Co., Cleveland.
New Jersey Mchy. Ex., Newark.
N. Y. Mchy. Exchange, N. Y.
Niles-Bement-Pond Co., N. Y.
Osborne & Sexton Mchry. Co., Columbus.
Platt Iron Works, Dayton.
Prentiss & Co., Henry, N. Y.
Purinton & Smith, Hartford.
Reliance Mchy. Sales Co., Pittsburgh
Richmond Forg. Corp., Richmond
Romaine Mchy. Co., Milwaukee.
Rothschild, A., Brooklyn
Russell Mch. Co., Pittsburgh.
Savage, W. H., Fitchburg.
Saxer Machy. Co., Erie.
Schoonmaker & Sons, A. G., N. Y.
Seifreat-Woodruff Co., Cincinnati
Seyferts Sons, Philadelphia.
Simmons Mach. Co., N. Y.
Standard Mchy. Co., New Haven.
Stickley Mach. Co., E. B., Detroit.
Stocker-Rumely-Wachs, Chicago.
Technical Products Co., N. Y.
Toomey, Frank., Philadelphia
Vandyck, Churchill Co., N. Y.
Vonnegut Machy. Co., Indianapolis.
Walsh Mchy. Co., M. J., Milwaukee.
Wayne Mchy. Co., Fort Wayne.
Wickes Mchy. Co., Jersey City.
Winterer, Herman L., Philadelphia.
Zelnicker Sup. Co., W. A., St. Louis

Diamond Tools
Crafts & Co., Arthur A., Boston.
Desmond-Stephan Mfg. Co., Urbana.
Dickinson, Thomas L., N. Y.
Francis & Co., Hartford.
Wheel Trueing Tool Co., Detroit.

Die Making Machines
Boston Tool & Mfg. Co., Boston.
Cochrane-Bly Co., Rochester.
Fairbanks Morse Co., N. Y.
Hergi Mfg. Co., Bridgeport.
Keller Mech. Engr. Co., Brooklyn
Thurston Mfg. Co., Providence.

Die Sinking Machines, Automatic
Keller Mech. Engrav. Co., Brooklyn.

Dies, Forging
Cramp Mfg. Co., Chicago.
Keller Mech. Engrav. Co., Brooklyn.

Dies, Screws & Thread Cutting
Geometric Tool Co., New Haven

Dies, Self-Opening Adjustable
Eastern Mch. Screw Corp., New Haven.
Geometric Tool Co., New Haven

Dies, Sheet Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
Eastern Mch. Screw Corp., New Haven
Errington, F. A., N. Y.
Geometric Tool Co., New Haven.
Greenfield T. & D. Corp., Greenfield
Herbert, Alfred, N. Y.
Ideal Tool & Mfg. Co., Beaver Falls
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mch. Co. Waynesboro
Modern Tool Co., Erie.
Murchey Mch. & Tool Co., Detroit.
National Acme Co., Cleveland.
National Machinery Co., Tiffin.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland.

Dividing Heads
New Britain Tool & Mfg. Co., New Britain.
Whiting & Comstock, Hartford.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago.
Union Tool Co, Orange.
West Steel Casting Co., Cleveland.
William & Co., J. H., Brooklyn.

Drafting Boards and Tables
American Lead Pencil Co., N. Y.
Spaulding-Moss Co., Boston.

Drafting Materials
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Bay State Stamping Co., Worcester
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Desmond-Stephan Mfg. Co., Urbana.
Francis & Co., Hartford
H. P. Company, Midland.
Norton Co., Worcester.
Standard Tool Co., Cleveland

Drill Holders
Armstrong Bros. Tool Co., Chicago.
Union Tool Co., Orange.

Drill Rods
Boker & Co., H., N. Y.
Herbert, Alfred, N. Y.

Drill Speeders
Graham Mfg. Co., Providence.
Turner Machine Co., Danbury.

Drilling Machine Heads
Hoefer Mfg. Co., Freeport.
Langelier Mfg. Co., Arlington, R. I.
Nelson-Blanch Mfg. Co., Detroit.
Sellew Mach. Tool Co., Pawtucket.

Drilling Machines, Automatic
Avey Drilling Mch. Co., Cincinnati
Baker Bros., Toledo, Ohio.
Bilton Mach. Tool Co., Bridgeport.
Langelier Mfg. Co., Arlington, R. I.
National Auto. Tool Co., Richmond
Russell Holbrook & Henderson, N. Y.

Drilling Machines, Bench
Ames Co., B. C., Waltham.
Avey Drilling Mach. Co., Cincinnati
Barnes Co., W. F. & John, Rockford
Bilton Mach. Tool Co., Bridgeport.
Burke Mach. Tool Co., Conneaut.
Clark Elec. Co., Jas., Jr., Louisville
Hoefer Mfg. Co., Freeport.
Langelier Mfg Co., Arlington, R. I.
Pratt & Whitney Co., Hartford.
Rockford Drilling Mch. Co., Rockford
Sloan & Chace Mfg. Co., Newark.
Standard Elect. T Co., Cincinnati
Taylor & Fenn Co., Hartford.
U. S. Electrical Tool Co., Cincinnati

Drilling Machines, Electric and Hand
Black & Decker Mfg. Co., Baltimore
Chicago Pneumatic Tool Co., N. Y.
Cincinnati Elec. Tool Co., Cincinnati
Clark Elec. Co., Jas., Jr., Louisville
Independent Pneu. T. Co., Chicago
Ingersoll-Rand Co., N. Y.
Neil & Smith Elec. T. Co., Cincinnati.
Standard Elect. T Co., Cincinnati
U. S. Elec. Tool Co., Cincinnati.
Wisconsin Electric Co., Racine.

Drilling, Machines, Gang
Baker Bros., Toledo.
Barnes Dri'l Co., Rockford.
Bilton Mch. Tool Co., Bridgeport.
Cincinnati (O.) Bickford Tool Co.
Colburn Mch. Tool Co., Franklin.
Langelier Mfg. Co., Arlington, R. I.
Moline Tool Co., Moline.
Sipp Mach. Co., Paterson.
Taylor & Fenn Co., Hartford.

Drilling Machines, Heavy Duty
Baker Bros., Toledo.
Betts Mach. Co., Rochester.
Colburn Mch. Tool Co., Franklin.
Hoefer Mfg. Co., Freeport.
Niles-Bement-Pond Co., N. Y.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Fox Mach. Co., Jackson.
Garrison Mach. Works, Dayton.
Harrington, Son & Co., Ed., Phila.
Langelier Mfg. Co., Arlington, R. I.
National Auto, T. Co., Richmond
Newton Mch. Tool Wks., Phila.
Rockford Drilling Mch. Co., Rockford
Sellers & Co., Wm., Philadelphia.
Turner Machine Co., Danbury.

Drilling Machines, Pneumatic
Cleveland Pneu. Tool Co., Cleveland
Independent Pneu. T. Co., Chicago
Ingersoll-Rand Co., N. Y.

Drilling Machines, Portable
Black & Decker Mfg., Baltimore
Cincinnati (O.) Elec. Tool Co.
Independent Pneu. T. Co., Chicago
Newton Mch. Tool Wks., Phila.
Stow Mfg. Co., Binghamton.
U. S. Elec. Tool Co., Cincinnati.
Wisconsin Elec. Co., Racine.

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Betts Mach. Co., Rochester.
Carlton Mach. Tool Co., Cincinnati.
Cincinnati (O.) Bickford Tool Co.
Cleveland (O.) Punch & Shear Wks
Dauber-Kratsch Co., Oshkosh
Dreses Mach. Tool Co., Cincinnati.
Fosdick Mach. Tool Co., Cincinnati
Hammond Mfg. Co., Cleveland.
Harrington, Son & Co., Ed., Phila.
Lynd-Farquhar Co., Boston.
Morris Mch. Tool Co., Cincinnati.
Mueller Mch. Tool Co., Cincinnati.
Newton Mch. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester.
Russell Holbrook & Henderson, N. Y.
Sellers & Co., Wm., Philadelphia.
Strong, Carlisle & Hammond, Cleveland.

Drilling Machines, Sensitive
Avey Drilling Mch. Co., Cincinnati
Bilton Mach. Tool Co., Bridgeport.
Coats Mch. Tool Co., N. Y.
Henry & Wright Mfg. Co., Hartford
Knight Mchy. Co., W. B., St. Louis.
Langelier Mfg. Co., Arlington, R. I.
Leland-Gifford Co., Worcester.
Reed-Prentice Co., Worcester.
Royersford Fdry & Mch Co., Royersford
Sipp Mach. Co., Paterson.
Taylor & Fenn Co., Hartford.
Wisconsin Electric Co., Racine.

Drilling Machines, Turret
National Auto. Tool Co., Richmond.
Turner Mch. Co., Danbury.

Drilling Machines, Vertical
Avey Drilling Mch. Co., Cincinnati.
Baker Bros., Toledo.
Barnes Co., W. F. & John, Rockford.
Barnes Drill Co., Rockford.
Betts Mch. Co., Rochester.
Cincinnati (O.) Bickford Tool Co.
Coats Mch. Tool Co., N. Y.
Colburn Mch. Tool Co., Franklin.
Davis Mch. Tool Co., Rochester.
Harrington, Son & Co., E., Phila.
Hoefer Mfg. Co., Freeport.
Knight Mchy. Co., W. B., St. Louis.
Langelier Mfg. Co., Arlington, R. I.
Leland-Gifford Co., Worcester.
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester.
Royersford Fdry. & Mch. Co., Royersford
Russell Holbrook & Henderson, N. Y.
Stow Mfg. Co., Binghamton
Taylor & Fenn Co., Hartford.
Turner Mch. Co., Danbury.

Drills, Center
Detroit Twist Drill Co., Detroit
Lincoln Twist Drill Co., Taunton.
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Reliance Steel & Tool Co., N. Y.
Slocomb Co., J. T., Providence.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol.

Drills, High Speed
Fast Feed Drill & Tool Corp., Toledo
Rich Tool Co., Chicago

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago.
Detroit Twist Drill Co., Detroit
Lincoln Twist Drill Co., Taunton.
National Twist D. & T. Co., Detroit
Reliance Steel & Tool Co., N. Y.
Union Twist Drill Co., Athol.

Drills, Twist and Flat
American Twist Drill Co., Detroit.
Buckeye Twist Drill Co., Alliance.
Clark Equip. Co., Buchanan.
Colton Co., Arthur, Detroit
Detroit Twist Drill Co., Detroit
Hammacher, Schlemmer & Co., N. Y.
Herbert, Alfred, N. Y.
Latrobe Tool Co., Latrobe.
Lincoln Twist Drill Co., N. Bedford
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol.

Dust Handling Equipment
Pangborn Corp., Hagerstown.

Dynamometers
General Electric Co., Schenectady.
Holtzer-Cabot Elect. Co., Boston

Electrical Instruments
Brown Instrument Co., Phila.
General Elec. Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Electrical Supplies
General Elec. Co., Schenectady.
Holtzer-Cabot Elect. Co., Boston
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Elevating Trucks (See Trucks)
Elevators and Conveyors
Albro-Clem Elevator Co., Phila.
Caldwell & Son Co., Chicago.
Link-Belt Co., Chicago, Phila.
Pangborn Corp., Hagerstown.

Emery Wheels (See Grinding Wheels)

Enamels, Machinery
Hilo Varnish Corp., Brooklyn.

Engineers, Mechanical
Fahnestock Eng. Co., Cincinnati
Hartford Special Mchy. Co., Hartford.
Service Eng. Co., N. Y.
Taft Peirce Mfg. Co., Woonsocket

Engraving Machinery
Engravers & Printers Mch. Co., Sag Harbor.
Gorton Mach. Co., Geo., Racine.
Keller Mech. Engr. Co., Brooklyn
Taft-Peirce Mfg. Co., Woonsocket.
Thum, W. A., St. Louis.

Expanders, Tube
Watson-Stillman Co., N. Y.
Eyeglass, Safety (See Goggles, Safety)

Eye Protectors
Willson & Co., T. A., Reading.

Fans, Electric
Crocker-Wheeler Co., Ampere.
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Exhaust
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Ventilating
General Electric Co., Schenectady.

Fibre
Wilmington Fibre Specialty Co., Wilmington.

File Handles
Grover File Co., Nashua, N. H.
Nicholson File Co., Providence.

Files and Rasps
American Swiss F. & T. Co., N. Y.
Barnett Co., G. & H., Philadelphia.
Delta File Wks., Philadelphia.
Grover File Co., Nashua.
Hammacher, Schlemmer & Co., N. Y.
Nicholson File Co., Providence.
Simonds Mfg. Co., Fitchburg
Vixen Tool Co., Newark

Filing Machines
Ames Co., B. C., Waltham.
Boston Tool & Mfg Co., Boston.
Cochrane-Bly Co., Rochester.
Colton Co., Arthur, Detroit
Noble & Westbrook Mfg. Co., Hartford.
Oliver Instrument Co., Adrian.
Thurston Mfg. Co., Providence.

Filler, Iron (See Cement, Iron)
Fittings, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Flexible Shafts
Chicago Flexible Shaft Co., Chicago
Errington, F. A., N. Y.
Gem Mfg. Co., Pittsburgh
Hergi Mfg. Co., Bridgeport.
Stow Mfg. Co., Binghamton

Flooring, Wood Blk.
Republic Creosoting Co., Indianapolis

Forging Machinery
Acme Mchry. Co., Cleveland.
Bradley & Son, C. C., Syracuse.
National Mchry. Co., Tiffin.

Forgings, Drop
Bearings Co. of America, Lancaster
Johnston & Jennings Co., Cleveland.
Universal Mch. Co., Bowling Green
Williams & Co., J. H., Brooklyn.

Forgings, Hammer
Halcomb Steel Co., Syracuse.
Hobson, Houghton & Co., N. Y.
Johnston & Jennings Co., Cleveland.
Williams & Co., J. H., Brooklyn.

Foundry Equipment
Adams Co., Dubuque.
Anderson Bros. Mfg. Co., Rockford
Atkins & Co., T. C., Indianapolis.
Whiting Fdry. Equip. Co, Harvey.

Foundry Supplies
Paxson Co., J. W., Philadelphia
Fuel, Oil Burning System
Advance Furnace & Eng. Co., Springfield, Mass.
Furnaces, Heat-Treating, Coal
Industrial Furnace Corp., Boston
Furnaces, Heat-Treating Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., N. Y.
Baird Pneu. Tool Co., Kansas City
Bennett Co., W. R., Elmwood
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Eclipse Fuel Eng. Co., Rockford
Industrial Furnace Corp., Boston
Johnson Gas Appliance Co., Cedar Rapids
Strong, Carlisle & Hammond Co., Cleveland
Tate, Jones & Co., Pittsburgh
Furnaces and Ovens, Electric
Brown Instrument Co., Phila.
Englehard, Charles, N. Y.
General Electric Co., Schenectady
Furnaces, Tempering and Annealing
Advance Furnace & Eng. Co., Springfield, Mass.
Bennett Co., W. R., Elmwood
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Eclipse Fuel Eng. Co., Rockford
General Electric Co., Schenectady
Johnson Gas Appliance Co., Cedar Rapids
Strong, Carlisle & Hammond, Cleveland
Tate, Jones & Co., Pittsburgh

Furniture, Machine Shop
Brown Engineering Co., Reading
Hergi Mfg. Co., Bridgeport
Manufacturing Equip. & Eng. Co., Framingham
New Britain Mch. Co., New Britain

Gage Blocks
Johannson, C. E., Poughkeepsie

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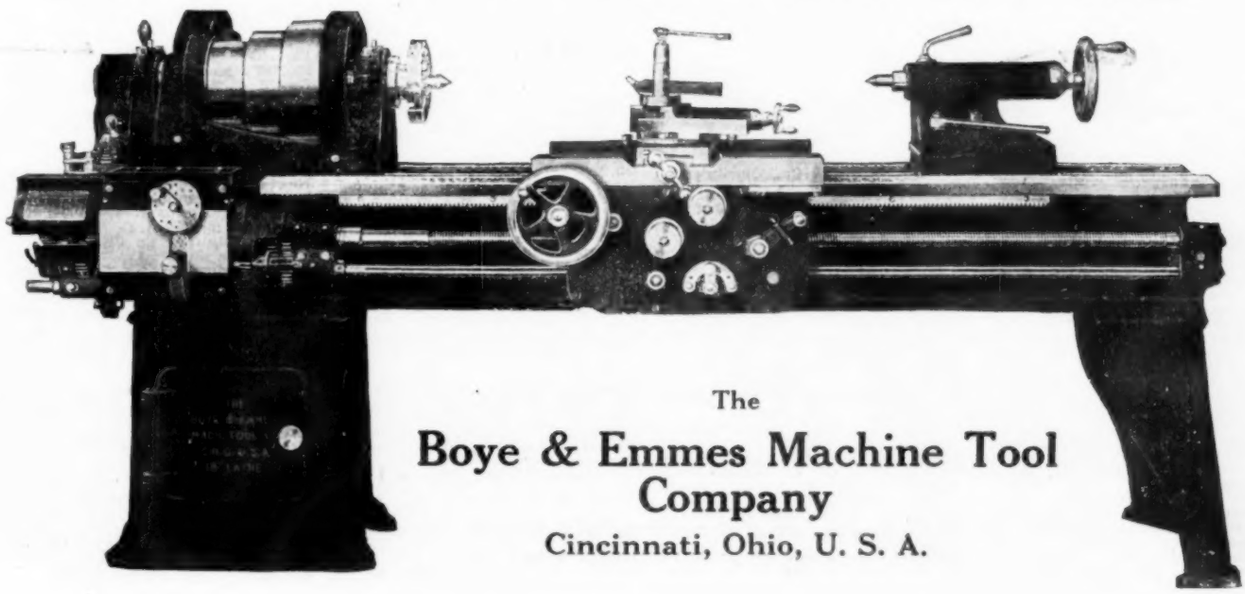


The

Boye & Emmes Machine Tool Company

Cincinnati, Ohio, U. S. A.

Pratt & Whitney Co., Hartford
Way Co., A. F., Hartford

Gages, Dial
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Niles-Bement-Pond Co., N. Y.
Starrett Co., L. S., Athol

Gages, Recording
Bristol Co., Waterbury
Brown Instrument Co., Phila.
General Electric Co., Schenectady

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Greenfield T. & D. Corp., Greenfield
Johansson, C. E., Poughkeepsie
M-S-G-L. Co., Syracuse
Niles-Bement-Pond Co., N. Y.

Gages, Special Measuring (See Tool Works)

Gages, Standard
Advance Tool Co., Cincinnati
Bicknell-Thomas Co., Greenfield
Brown & Sharpe Mfg. Co., Providence
Coats Mach. Tool Co., N. Y.
Greenfield T. & D. Corp., Greenfield
Hartford Special Mchy. Co., Hartford
Johansson, C. E., Poughkeepsie
Meldrum-Semon-Greiner-Lowry Co., Syracuse
Niles-Bement-Pond Co., N. Y.

Gages, Thread
Brown & Sharpe Mfg Co., Providence
Cotton, H. W., N. Y.
Greenfield T. & D. Corp., Greenfield
Niles-Bement-Pond Co., N. Y.
Sheffield Mach. & Tool Co., Dayton
Taft-Peirce Mfg. Co., Woonsocket

Galvanizing Outfits, Electro
Cutter & Wood Supply Co., Boston

Gas, Compressed
Davis-Bournonville Co., Jersey City

Gaskets
Graton & Knight Mfg. Co., Worcester

Gear Blanks
Johnston & Jennings Co., Cleveland

Gear Cutting Machines
Adams Co., Dubuque
Barber-Colman Co., Rockford
Becker Milling Mch. Co., Hyde Park
Bilgram Mch. Wks., Philadelphia
Bilton Mch. Tool Co., Bridgeport
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mch. Co.
Clough, R. M., Meriden
Fellows Gear Shaper Co., Springfield, Vt.
Flather & Co., Nashua
Garvin Mch. Co., N. Y.
Gleason Works, Rochester
Gould & Eberhardt, Rochester
Harrington, Son & Co., Edwin, Phila.
Lees-Bradner Co., Cleveland
Newark Gear Cutting Mch. Co., Newark
Newton Mch. Tool Wks., Phila.
Sloan & Chace Mfg. Co., Newark
Strong, Carlisle & Hammond Co., Cleveland
Waltham Mch. Wks., Waltham
Whiting & Comstock, Hartford
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Adams Co., Dubuque
Brown & Sharpe Mfg. Co., Providence
Gisholt Mch. Co., Madison
Gleason Works, Rochester

Gears, Cast
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Caldwell & Son Co., H. W., Chicago
Carpenter Tew Gear Co., Brooklyn
Franklin Die Cast Corp., Syracuse
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Phila.
Meisel Press Mfg. Co., Boston
Philadelphia Gear Wks., Phila.

Gears, Cut
Adams Co., Dubuque
Albaugh-Dover Co., Chicago
Albro-Clem Elevator Co., Phila.
Akron Gear & Eng. Co., Akron
Bilgram Mch. Wks., Philadelphia
Boston Gear Wks., Quincy
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Carpenter Tew Gear Co., Brooklyn
Chicago Rawhide Mfg. Co., Chicago
Cincinnati (O.) Gear Co.
Crofoot Gear Wks., Cambridge
Faweus Mch. Co., Pittsburgh
Fellows Gear Shaper Co., Springfield, Vt.
Flather & Co., Nashua
Foote Bros. G. & M. Co., Chicago
Ganschow Co., Wm., Chicago
Garvin Mch. Co., N. Y.
General Electric Co., Schenectady
Gleason Works, Rochester
Gould & Eberhardt, Newark
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A., Chicago
Lees-Bradner Co., Cleveland
Link-Belt Co., Chicago, Phila.
M C Mfg. Co., Newark
Meacham Gear Corp., Syracuse
Meisel Press Mfg. Co., Boston
National Mch. & Tool Co., Boston
Newark Gear Cutting Mch. Co., Newark
New Britain Mch. Co., New Britain
Nuttall Co., R. D., Pittsburgh
Philadelphia Gear Wks., Phila.
Simonds Mfg. Co., Pittsburgh
Steele Co., W. M., Worcester
Taft-Peirce Mfg. Co., Woonsocket
Union Gear & Mch. Co., Boston

Gears, Forged
Machinery Forging Co., Cleveland

Gears, Herringbone
Boston Gear Wks., Quincy
Carpenter Tew Gear Co., Brooklyn
Faweus Machine Co., Pittsburgh
Lees-Bradner Co., Cleveland
Meisel Press Mfg. Co., Boston
Union Gear & Mch. Co., Boston

Gears, Rawhide (See Gears, Cut)

Gears, Worm
Lees-Bradner Co., Cleveland
Philadelphia Gear Wks., Phila.

Generators, Electric
Crocker-Wheeler Co., Ampere
General Electric Co., Schenectady
Holtzer-Cabot Elect. Co., Boston
Reliance Elec. & Eng. Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Goggles, Safety
King Optical Co., Julius, N. Y.

Grab Buckets
Link-Belt Co., Chicago, Phila.

Greases, Lubricating
Royersford Fdry. & Mch. Co., Royersford
Texas Co., N. Y.
White & Bagley Co., Worcester

Grinders, Ring Wheel
Badger Tool Co., Detroit

Grinding Machines, Abrasive Belt
Production Mch. Co., Greenfield.

Grinding Machines, Automatic
Production Mach. Co., Greenfield

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Bench
Athol Machine Co., Athol
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Clark Electric Co., Jas., Jr., Louisville
Diamond Machine Co., Providence
Forbes & Myers, Worcester
Greenfield T. & D. Corp., Greenfield
Hergi Mfg. Co., Bridgeport
New Britain Mch. Co., New Britain
Norton Co., Worcester
Precision & T. G. Mfg. Co., Phila.
Ransom Mfg. Co., Oshkosh
Safety Emery Wheel Co., Springfield, O.
Standard Elect. T Co., Cincinnati
Union Twist Drill Co., Athol
U. S. Elec. Tool Co., Cincinnati
Walker Co., O. S. Worcester

Grinding Machines, Center
Cincinnati (O.) Elec. Tool Co.
Gem Mfg. Co., Pittsburgh
Standard Elect. T Co., Cincinnati

Grinding Machines, Chaser
Geometric Tool Co., New Haven

Grinding Machines, Chucking
Blanchard Mch. Co., Cambridge
Bryant Chucking Grinder Co., Springfield, Vt.
Churchill, Morgan, Crittsinger, Worcester
Fraser Co., Warren F., Westboro
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
Stow Mfg. Co., Binghamton
Van Norman Mch. Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago
Barnes, Wm. O., Leominster
Barnes Co., W. F. & John, Rockford
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence.
Cincinnati (O.) Gear Cutting Mch. Co.
Cincinnati (O.) Milling Mch. Co.
Diamond Machine Co., Providence
Fraser Co., Warren F., Westboro
Garvin Mch. Co., N. Y.
Gisholt Mach. Co., Madison
Gould & Eberhardt, Newark
Grand Rapids Grinding Mch. Co., Grand Rapids
Greenfield Mch. Co., Greenfield
Greenfield T. & D. Corp., Greenfield
Heald Mch. Co., Worcester
Herbert, Alfred, N. Y.
Ingersoll Milling Mch. Co., Rockford
Landis Tool Co., Waynesboro
LeBlond Mch. Tool Co., R. K., Cincinnati
Modern Tool Co., Erie
Noble & Westbrook Mfg. Co., Hartford
Norton Co., Worcester
Oakley Mch. Tool Co., Cincinnati
Oesterlein Mch. Co., Cincinnati
Ott Grinder Co., Indianapolis
Pratt & Whitney Co., Hartford
Precision & T. G. Mfg. Co., Phila.
Russell Holbrook & Henderson, N. Y.
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Standard Tool Co., Cleveland
Sterling Grind. Wheel Co., Tiffin
Taylor & Fenn Co., Hartford
Union Twist Drill Co., Athol
U. S. Electrical Co., Cincinnati
Universal Grind. Mch. Co., Fitchburg
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids
Woods Engineering Co., Alliance

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck. Grinder Co., Springfield, Vt.
Cincinnati Grinder Co., Cincinnati
Detroit Machine Tool Co., Detroit
Fitchburg Grind. Mch. Co., Fitchburg
Fraser Co., Warren F., Westboro.
Greenfield Mach. Co., Greenfield.
Heald Mach. Co., Worcester.
Landis Tool Co., Waynesboro.
Modern Tool Co., Erie.
Morse Twist D. & M. Co., New Bedford
Norton Co., Worcester.
Oesterlein Mach. Co., Cincinnati.
Ott Grinder Co., Indianapolis.
Pratt & Whitney Co., Hartford.
Precision & T. G. Mfg. Co., Phila.
Rivett Lathe & Grinder Co., Boston.
Russell Holbrook & Henderson, N. Y.
Sanford Mfg. Co., F. C., Bridgeport.
Taft-Peirce Mfg. Co., Woonsocket
Universal Grind. Mch. Co., Fitchburg
Van Norman Mch. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester.
Whitney & Son, Baxter D., Winchendon.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Die
Abrasive Mch. Tool Co., E. Providence.
Bignall & Keeler Mch. Wks., Edwardsville.
Blanchard Mach. Co., Cambridge.
Diamond Mach. Co., Providence.
Geometric Tool Co., New Haven.
Heald Mch. Co., Worcester.
Murchey Mch. & Tool Co., Detroit.
National Mchy. Co., Tiffin.
Newton Mch. Tool Wks., Phila.
Noble & Westbrook Mfg. Co., Hartford.
Precision & T. G. Mfg. Co., Phila.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Disc
Armstrong Bros. Tool Co., Chicago.
Badger Tool Co., Beloit.
Besly & Co., Charles H., Chicago.
Diamond Mach. Co., Providence.
Gardner Mach. Co., Beloit.
Murray Mylea Mch. Co., Antigo
Rowbottom Mach. Co., Waterbury.

Grinding Machines, Drill
Grand Rapids Grinding Mch. Co., Grand Rapids
Greenfield T. & D. Corp., Greenfield
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia.
Sterling Grind. Wheel Co., Tiffin.
U. S. Elec. Tool Co., Cincinnati.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Face
Blanchard Mach. Co., Cambridge.
Bristol Mach. Tool Co., Bristol.
Detroit Machine Tool Co., Detroit
Diamond Mach. Co., Providence.
Persons-Arter Mach. Co., Worcester.

Grinding Machines, Floor and Tool
Blount Co., J. G., Everett.
Brown & Sharpe Mfg. Co., Providence.
Detroit Machine Tool Co., Detroit
Diamond Mach. Co., Providence.
Forbes & Myers, Worcester.
New Britain Mch. Co., New Britain
Noble & Westbrook Mfg. Co., Hartford.
Norton Co., Worcester.
Ransom Mfg. Co., Oshkosh.
Royersford Fdry. & Mch. Co., Royersford
Safety Emery Wheel Co., Springfield, O.
Sterling Grind. Wheel Co., Tiffin.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Gage
Abrasive Mch. Tool Co., E. Providence.
Fraser Co., Warren F., Westboro.
Landis Tool Co., Waynesboro.
Ott Grinder Co., Indianapolis.
Precision & T. G. Mfg. Co., Phila.
Rivett Lathe & Grinder Co., Boston.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Hexagon
Sanford Mfg. Co., F. C., Bridgeport.

Grinding Machines, Internal
Bryant Chuck. Grinder Co., Springfield, Vt.
Churchill, Morgan, Crittsinger, Worcester.
Fraser Co., Warren F., Westboro.
Garvin Mach. Co., N. Y.
Greenfield Mch. Co., Greenfield.
Greenfield T. & D. Corp., Greenfield
Heald Machine Co., Worcester.
Landis Tool Co., Waynesboro.
Ott Grinder Co., Indianapolis.
Pratt & Whitney, Hartford.
Rivett Lathe & Grinder Co., Boston.
Taft-Peirce Mfg. Co., Woonsocket.
Universal Grind. Mch. Co., Fitchburg.
Van Norman Mch. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester.
Whitney & Son, Baxter D., Winchendon.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago.
Black & Decker Mfg. Co., Baltimore
Chicago Pneu. Tool Co., N. Y.
Cincinnati Elec. Tool Co., Cincinnati
Clark Elec. Co., Jas., Jr., Louisville.
Cleveland Pneu. Tool Co., Cleveland.
Gem Mfg. Co., Pittsburgh.
Herbert, Alfred, N. Y.
Hergi Mfg. Co., Bridgeport.
Independent Pneu. Tool Co., Chicago
Neil & Smith Elec. T. Co., Cincinnati.
Precision & T. G. Mfg. Co., Phila.
Stow Mfg. Co., Binghamton
U. S. Elec. Tool Co., Cincinnati.
Wisconsin Electric Co., Racine.

Grinding Machines, Power, Oscillating, Tool
Herbert, Alfred, N. Y.

Grinding Machines, Radial
Landis Tool Co., Waynesboro.
Rivett Lathe & Grind. Co., Boston.
Van Norman Mch. Tool Co., Springfield, Mass.

Grinding Machines, Ring Wheel
Besly & Co., Charles H., Chicago.
Diamond Mach. Co., Providence.
Gardner Mach. Co., Beloit.

Grinding Machines, Snagging
Blount Co., J. G., Everett.
Diamond Mach. Co., Providence.
Hergi Mfg. Co., Bridgeport.
Ransom Mfg. Co., Oshkosh.
Walker Co., O. S., Worcester.

Grinding Machines, Surface
Abrasive Mch. Tool Co., E. Providence.
Blanchard Mch. Co., Cambridge.
Bristol Mch. Tool Co., Bristol.
Brown & Sharpe Mfg. Co., Providence.
Detroit Machine Tool Co., Detroit
Diamond Mach. Co., Providence.
Fraser Co., Warren F., Westboro.
Heald Mach. Co., Worcester.
National Machine Co., Hartford
Newton Mch. Tool Wks., Phila.
Noble & Westbrook Mfg. Co., Hartford
Persons-Arter Mach. Co., Worcester.
Pratt & Whitney Co., Hartford.
Rowbottom Mach. Co., Waterbury.
Safety Emery Wheel Co., Springfield, O.
Taft-Peirce Mfg. Co., Woonsocket.
Universal Grind. Mch. Co., Fitchburg.
Walker Co., O. S., Worcester.
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Thread
Precision & T. G. Mfg. Co., Phila.

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence.
Cincinnati Grinder Co., Cincinnati.
Fraser Co., Warren F., Westboro.
Grand Rapids Grind. Mach. Co.
Greenfield Mach. Co., Greenfield.
Greenfield T. & D. Corp., Greenfield
Independent Pneu. T. Co., Chicago
Landis Tool Co., Waynesboro.
Ott Grinder Co., Indianapolis.

SQUARE Shoulders Needn't Cost More

Grind With the FRASER

The Fraser No. 21 Plain Grinder has solved this grinding difficulty just as it has many others. The Power longitudinal feed for the table operates with a smooth, accurate stroke that allows the shoulder to be ground close to the wheel without injury.

If your grinding is within the limits of Fraser No. 21 (5-in. x 18-in.) why spend a fancy figure for an intricate grinder? This machine, built by grinding specialists, has never been surpassed for plain finishing.

Whether your job be "plain" or "fancy" there is a Fraser that grinds it best. Put it up to Fraser today.

Warren F. Fraser Co.

Westboro, Mass.

Russell Holbrook & Henderson, N. Y.
Taft-Peirce Mfg. Co., Woonsocket.
Universal Grind. Mch. Co., Fitchburg.
Wilmarth & Morman Co., Grand Rapids.
Woods Engrg. Co., Alliance.

Grinding Wheels
Carborundum Co., Niagara Falls.
Cortland Grind. Wheel Co., Cortland
Cutter & Wood Supply Co., Boston.
Dickinson, Thomas L., N. Y.
Hampden Corundum Wheel Co., Springfield.
Herbert, Alfred, N. Y.
Hergi Mfg. Co., Bridgeport.
Maxf. Grind. Wheel Co., Chester
Norton Co., Worcester.
Safety Emery Wheel Co., Springfield, O.
Sterling Grind. Wheel Co., Tiffin.
Superior Corundum Wheel Co., Waltham.

Gun Barrel Machinery
Pratt & Whitney Co., Hartford.
Sloan & Chace Mfg. Co., Newark.

Hack Saws, Power
Atkins & Co., E. C., Indianapolis.

Hammering Machines
Langelier Mfg. Co., Arlington.

Hammers, Drop
Bradley & Son, C. C., Syracuse.
Niles-Bement-Pond Co., N. Y.
Toledo Mch. & Tool Co., Toledo.

Hammers, Electric
Hergi Mfg. Co., Bridgeport.
Nazel Eng. & Mch. Wks., Phila.
United Hammer Co., Boston

Hammers, Pneumatic
Cleveland (O.) Pneu. Tool Co.
Hergi Mfg. Co., Bridgeport.
Independent Pneu. T. Co., Chicago
Ingersoll-Rand Co., N. Y.

Hammers, Power
Bliss Co., E. W., Brooklyn
Bradley & Son, C. C., Syracuse.
Little, Giant Co., Mankato
Nazel Eng. & Mch. Wks., Phila.
Niles-Bement-Pond Co., N. Y.
United Hammer Co., Boston
West Tire Setter Co., Rochester.

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago.
Bond Fdry. & Mch. Co., Manheim.
Brown & Sharpe Mfg. Co., Providence.
Gurney Ball Bearing Co., Jamestown.
Hyatt Roller Bearing Co., N. Y.
New Departure Mfg. Co., Bristol.
Royersford Fdry. & Mch. Co., Royersford
S K F Industries, Hartford.

Hardening, Case-Hardening and Tempering
Bennett Co., W. R., Elmwood.
Eclipse Fuel Eng. Co., Rockford.
Garwood B. & I. Wks., Garwood
General Mach. Works, York.
Williams & Co., J. H., Brooklyn.

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y.

Hobbing Machines
Adams Co., Dubuque.
Barber-Colman Co., Rockford.
Bilton Mch. Tool Co., Bridgeport.
Cincinnati (O.) Gear Cutting Mch.
Gould & Eberhardt, Newark.
Hercules Mch. & Tool Co., N. Y.
Lees-Bradner Co., Cleveland.
M-C Mfg. Co., Newark.

Hobs
Barber-Colman Co., Rockford.
Boston Gear Wks., Norfolk Downs.
Brown & Sharpe Mfg. Co., Providence.
Goddard Tool Co., Chicago.
Gould & Eberhardt, Newark.
Greenfield T. & D. Corp., Greenfield
Lees-Bradner Co., Cleveland.
National Tool Co., Cleveland.
Taft-Peirce Mfg. Co., Woonsocket.
Union Twist Drill Co., Athol.

Hoists, Electric
Crocker-Wheeler Co., Ampere.
Link-Belt Co., Chicago, Philadelphia
Niles-Bement-Pond Co., N. Y.
Northern Engineering Wks., Detroit
Pawling & Harnischfeger Co., Milwaukee.
Shepard Elect. C. & H. Co., Montour Falls
Westinghouse Elect. & Mfg. Co., E. Pittsburgh
Yale & Towne Mfg. Co., Stamford

Hoists, Hand
Fdry. & Mch. Co., Canton.
Chisholm-Moore Mfg. Co., Cleveland
Ford Chain Block & Mfg. Co., Phila.
Harrington, Son & Co., Ed., Phila.
Reading Chain Block Co., Reading.
Yale & Towne Mfg. Co., Stamford.

Hoists, Pneumatic
Independent Pneu. T. Co., Chicago
Ingersoll-Rand Co., N. Y.
Whiting Fdry. Equip. Co., Harvey.

Holders-On, Pneumatic
Independent Pneu. T. Co., Chicago

Hydraulic Leather
Schieren Co., Chas. A., N. Y.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn.
Holtzer-Cabot Elect. Co., Boston

Indicating Calipers
Horstmann Co., F. W., Irvington

Indicators, Speed and Test
Boston Tool & Mfg. Co., Boston.
Brown & Sharpe Mfg. Co., Providence.
Johnson & Miller, N. Y.
Marvin & Casler Co., Canastota.
Norton Co., Worcester.
Starrett Co., L. S., Athol.
Veeder Mfg. Co., Hartford.

Inspectors
Souther Eng. Corp., Hy., Hartford.

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago.

Japans
Hilo Varnish Corp., Brooklyn.

Jigs and Fixtures (See Tool Work)

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence.
Gray & Prior Mch. Co., Hartford.
Manufacturing Equip. & Eng. Co., Framingham.

Keyseating Machines
Baker Bros., Toledo.
Davis Mch. T. Co., C. F., Rochester
Lapointe Co., J. N., New London.
Lapointe Mach. Tool Co., Hudson.
Morton Mfg. Co., Muskegon Heights
National Mch. T. Co., Cincinnati
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.

Keys, Machine
Detroit Twist Drill Co., Detroit
Morton Mfg. Co., Muskegon Heights
Standard Gauge S. Co., Beaver Falls
Whitney Mfg. Co., Hartford.
Williams & Co., J. H., Brooklyn.

Knives, Machine
Simonds Mfg. Co., Fitchburg, Mass.

Knurl Holders
Graham Mfg. Co., Providence.
Williams & Co., J. H., Brooklyn.

Lacing Leather
Schieren Co., Chas. A., N. Y.

Ladders, Permanent
New Britain Mch. Co., New Britain

Lamps, Electric
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Lathe Attachments
Ames Co., B. C., Waltham.
Dalton Mfg. Corp., N. Y.
Flather & Co., Nashua
Hendey Mach. Co., Torrington.
Rivett Lathe & Grinder Co., Boston.
Sloan & Chace Mfg. Co., Newark.
Williams & Co., J. H., Brooklyn

Lathe Pans, Portable
New Britain Mch. Co., New Britain

Lathe Tools
Armstrong Bros. Tool Co., Chicago.
Gisholt Mch. Co., Madison.
Herbert, Alfred, N. Y.
Lovejoy Tool Co., Springfield, Vt.
Union Tool Co., Orange.
Western T. & Mfg. Co., Springfield
Williams & Co., J. H., Brooklyn.

Lathes, Automatic and Semi-Automatic
Coats Mach. Tool Co., N. Y.
Gisholt Mach. Co., Madison.
Herbert, Alfred, N. Y.
Jones & Lamson Mch. Co., Springfield.
National Acme Co., Windsor.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester.
Steinle Turret Mach. Co., Madison.
Wood Turret Mach. Co., Brazil.

Lathes, Bench
Ames Co., B. C., Waltham.
Blount Co., J. G., Everett.
Dalton Mfg. Corp., N. Y.
Diamond Mach. Co., Providence.
Elgin Tool Works, Elgin.
Greenfield T. & D. Corp., Greenfield
Oliver Mfg. Co., O. O., Buffalo.
Potter Tool & Mch. Wks., N. Y.
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., Boston
Russell Holbrook & Henderson, N. Y.
Seneca Falls Mfg. Co., Seneca Falls
Sloan & Chace Mfg. Co., Newark
South Bend Lathe, South Bend
Stark Tool Co., Waltham
Van Norman Mch. Tool Co., Springfield, Mass.
Wade-American Precision Tool Co., Boston.

Lathes, Boring
Gisholt Mch. Co., Madison.
Niles-Bement-Pond Co., N. Y.
Potter & Johnston Mch. Co., Pawtucket.

Lathes, Chucking (See Lathes, Horizontal Turret)

Lathes, Engine
Adams Mfg. Co., O. R., Rochester.
American Tool Wks. Co., Cincinnati
Barnes Co., W. F. & John, Rockford.
Barnes Drill Co., Rockford.
Blount Co., J. G., Everett.
Boye & Emmes Mch. Tool Co., Cincinnati.
Bradford Mch. Tool Co., Cincinnati
Bullard Mch. Tool Co., Bridgeport.
Champion Tool Wks. Co., Cincinnati
Chard Lathe Co., Newcastle.
Cincinnati (O.) Lathe & Tool Co.
Dalton Mfg. Corp., N. Y.
Davis Mach. Tool Co., Rochester.
Fairbanks Co., N. Y.
Fitchburg Mach. Wks., Fitchburg.
Flather & Co., Nashua
Giddings & Lewis Mch. T. Co., Fond du Lac.
Gisholt Mach. Co., Madison.
Greaves Klusman Tool Co., Cincinnati
Greaves Mach. Tool Co., Cincinnati
Hamilton Mch. Tool Co., Hamilton
Hendey Mch. Co., Torrington.
Herbert, Alfred, N. Y.
Hill, Clarke & Co., Boston
LeBlond Mch. Tool Co., R. K., Cincinnati.
Lehmann Mach. Co., St. Louis
Lodge & Shipley Mch. T. Co., Cincinnati.
Monarch Mch. Tool Co., Sidney.
Morris Mch. Tool Co., Cincinnati.
Mueller Mch. Tool Co., Cincinnati.
Niles-Bement-Pond Co., N. Y.
Pittsburgh Mch. Tool Co., Braddock
Reed-Prentice Co., Worcester.
Rockford Drilling Mch. Co., Rockford
Rockford Lathe & D. Co., Rockford
Rockford Tool Co., Rockford.
Russell Holbrook & Henderson, N. Y.
Seneca Falls Mfg. Co., Seneca Falls
Sidney Mch. Tool Co., Sidney.
Springfield Mch. Tool Co., Springfield, O.
Strong, Carlisle & Hammond Co., Cleveland.
Union Lathe Works, York.
Whitcomb-Blaisdell Mch. T. Co., Worcester.
Willard Mch. T. Co., Cincinnati
Wickes Bros., Saginaw.

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
Barnes Drill Co., Rockford.
Harrington, Son & Co., Ed., Phila.
Niles-Bement-Pond Co., N. Y.

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford.
Dalton Mfg. Corp., N. Y.
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Heavy Duty Projectile Boring
Axelson Machine Co., Los Angeles.
Pittsburgh Mch. T. Co., Braddock

Lathes, Horizontal Turret
Acme Mach. Tool Co., Cincinnati.
Dreses Mach. Tool Co., Cincinnati.
Foster Mach. Co., Elkhart.
Gisholt Mach. Co., Madison.
Herbert, Alfred, N. Y.
International Mch. Tool Co., Indianapolis.
Jones & Lamson Mch. Co., Springfield, Vt.
McCabe, J. J., Lathe & Mchy. Corp., N. Y.
Milholland Mch. Co., Indianapolis.
New Britain Mch. Co., New Britain
Pratt & Whitney Co., Hartford.
Reed-Prentice Co., Worcester.
Steinle Turret Mch. Co., Madison.
Warner & Swasey Co., Cleveland.
Wood Turret Mch. Co., Brazil.

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Relieving
Cleveland (O.) Milling Mach. Co.

Lathes, Speed and Hand
Blount Co., J. G., Everett.
Brown & Sharpe Mfg. Co., Providence.
Diamond Machine Co., Providence.
Garvin Machine Co., N. Y.
Greenfield T. & D. Corp., Greenfield
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Threading
Automatic Mach. Co., Bridgeport.
Rivett Lathe & Grinder Co., Boston
Sloan & Chace Mfg. Co., Newark.

Lathes, Vertical Turret
Bullard Mch. Tool Co., Bridgeport.

Lathes, Wood Turning
Barnes Co., W. F. & John, Rockford, Ill.
Blount Co., J. G., Everett.
Seneca Falls Mfg. Co., Seneca Falls

Letters and Figures
Brown & Sharpe Mfg. Co., Providence.
Hoggson & Pettis Mfg. Co., New Haven.
Pannier Bros. Stamp Co., Pittsburgh.

Lighting Fixtures
Miller Saw Trimmer Co., Pittsburgh.

Lockers, Clothes
Manufacturing Equip. & Eng. Co., Framingham.

Lubricants
Oakley Chemical Co., N. Y.
Royersford Fdry. & Mch. Co., Royersford
Texas Co., N. Y.
White & Bagley Co., Worcester.

Lubricating Systems
Bowser & Co., S. F., Fort Wayne.

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago.
Athol Machine Co., Athol.
Brown & Sharpe Mfg. Co., Providence.
Fairbanks Co., N. Y.
Grover File Co., Nashua.
Hammacher, Schlemmer & Co., N. Y.
Herbert, Alfred, N. Y.
Hergi Mfg. Co., Bridgeport.
Keystone R. & T. Co., Millersburg
Pratt & Whitney Co., Hartford.
Simplex Tool Co., Woonsocket.
Slocomb Co., J. T., Providence.
Starrett Co., L. S., Athol.
Taft-Peirce Mfg. Co., Woonsocket.
Williams & Co., J. H., Brooklyn.
Union Tool Co., Orange.

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence.
Cochrane-Bly Co., Rochester.
Manufacturers Equip. Co., Chicago.
Morse Twist D. & M. Co., New Bedford.
Nicholson & Co., W. H., Wilkes-Barre.
Western T. & Mfg. Co., Spring-

Mandrels, Solid
Advance Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence.
Lincoln Twist Drill Co., Taunton.
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Standard Tool Co., Cleveland

Marking Devices (See Stamps, Steel)

Marking Machines
Engravers & Printers Mch. Co., Sag Harbor.
Noble & Westbrook Mfg. Co., Hartford.

Measuring Machines
Norma Co. of America, N. Y.
Pratt & Whitney Co., Hartford.
Taft-Peirce Mfg. Co., Woonsocket.

Metal Cleaning Equipment
Pangborn Corp., Hagerstown.

Metal Finishes
Hilo Varnish Corp., Brooklyn.

Metals, Alloy
International Nickel Co., N. Y.
White Heat Products Co., Frazer

Meters, Steam Flow
General Electric Co., Schenectady

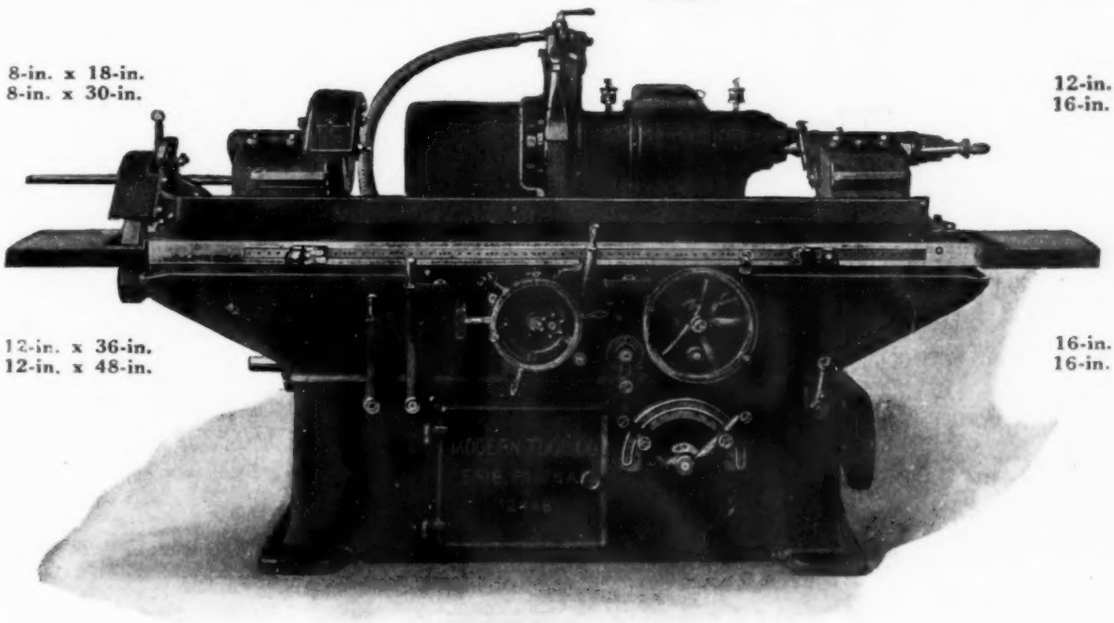
Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham.
Brown & Sharpe Mfg. Co., Providence.
Slocomb Co., J. T., Providence.
Starrett Co., L. S., Athol.

Milling Attachments
Adams Co., Dubuque.
Becker Milling Mch. Co., Hyde Park.
Brown & Sharpe Mfg. Co., Providence.
Cincinnati (O.) Milling Mch. Co.
Cleveland (O.) Milling Mch. Co.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Hendey Machine Co., Torrington.
Ingersoll Milling Mch. Co., Rockford.
Kearney & Trecker Co., Milwaukee.
Kempsmith Mfg. Co., Milwaukee.
LeBlond Mch. Tool Co., R. K., Cincinnati.
Oesterlein Mch Co., Cincinnati
Potter & Johnston Mch. Co., Pawtucket.
Sloan & Chace Mfg. Co., Newark.
Standard Eng. Wks., Pawtucket.
Taft-Peirce Mfg. Co., Woonsocket.
Whiting & Comstock, Hartford.

MODERN
Plain Grinding Machines

8-in. x 18-in.
8-in. x 30-in.

12-in. x 60-in.
16-in. x 36-in.



12-in. x 36-in.
12-in. x 48-in.

16-in. x 48-in.
16-in. x 60-in.

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Greenfield T. & D. Corp., Greenfield
Morse Twist D. & M. Co., New Bedford

Screws, Cap and Set
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.
Hammacher, Schlemmer & Co., N. Y.
National Acme Co., Cleveland.
Strong, Carlisle & Hammond, Cleveland.

Screws, Machine
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.
Hammacher, Schlemmer & Co., N. Y.

Screws, Safety Set
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.
Hammacher, Schlemmer & Co., N. Y.
Strong, Carlisle & Hammond, Cleveland.

Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery (See Searchlight Section)
American Mchy. Exchange, N. Y.
American Shipb'ld'g Co., Cleveland
Barbour, Love & Woodward, N. Y.
Bath & Co., Cyril J., Cleveland.
Beal & Co., Joseph, Boston.
Bennett Mchy. Co., G. L., N. Y.
Bosworth, W. H., Cleveland.
Botwink Bros., New Haven
Brownell Mchy. Co., Providence.
Buffalo House Wreck. & Sal. Co., Buffalo.
Burroughs Baldwin Co., N. Y.
Cincinnati Planer Co., Cincinnati.
Clifton-Pratt Co., Cincinnati.
Day Machinery Co., Buffalo.
Duff Co., J. E., N. Y.
Du Pont Chemical Co., Wilmington.
Eastern Mchy. Co., Cincinnati.
Eddy Mchy. Co., Ed., Providence.
Federal Mchy. Sales Co., Chicago.
Freidus Mchy. Co., N. Y.
Froiland, Paul, Springfield.
Garvin Machine Co., N. Y.
Gelb & Co., J., N. Y.
Graves Mchy. Exchange, N. Y.
Hannon Finton Co., Springfield
Harris Bros. Co., Chicago.
Hill, Clarke & Co., Boston.
Hill, Clarke & Co., Chicago.
Ideal Mchy. Co., Plainsville
Industrial Mchy. Corp., Jersey City.
Kinsey Co., E. A., Cincinnati.
Lamberg & Co., A., N. Y.
Lucas & Son, J. L., Bridgeport.
Lynd Farquhar Co., Boston.
McMullen Mchy. Co., Grand Rapids.
Machine Tool Eng. Co., N. Y.
Marshall & Huschart Mchy. Co., Chicago
Maidhof & Ashton, Troy
Modern Mchy. Exchange, N. Y.
Morey & Co., N. Y.
Motch & Merryweather Mchy. Co., Cleveland.
N. J. Mchy. Exchange, Newark.
N. Y. Mchy. Exchange, N. Y.
Niles-Bement-Pond Co., N. Y.
Norton Bros. Mchy. Co., Cincinnati
Osborne & Sexton Mchy. Co., Columbus.
Platt Iron Works, Dayton.
Prentiss & Co., Henry, N. Y.
Progress Machine Wks., Chicago
Purinton & Smith, Hartford.
Reliance Mchy. Sales Co., Pittsburgh
Richmond Forging Corp., Richmond.
Romaine Mchy. Co., Milwaukee
Rothschild, R., Brooklyn
Russell Mch. Co., Pittsburgh.
Savage, W. H., Fitchburg.
Saxer Machinery Co., Erie.
Schoonmaker & Sons, A. G., N. Y.
Seifreat-Woodruff Co., Cincinnati
Seyfert's Sons, L. F., Philadelphia
Simmons Mch. Co., N. Y.
Standard Mchy. Co., New Haven
Stickley Mch. Co., E. B., Detroit.
Stocker-Rumely-Wachs Co., Chicago
Technical Products Co., N. Y.
Toomey, Frank, Philadelphia
Vonnegut Mchy. Co., Indianapolis
Walsh Mchy. Co., M. J., Milwaukee
Wayne Mchy. Co., Fort Wayne.
Wickes Mchy. Co., Jersey City.
Winterer, Herman L., Philadelphia
Zelmecker Sup. Co., W. A., St. Louis

Separators, Moisture and Oil
Pangborn Corp., Hagerstown

Separators, Oil and Waste
Oil & Waste Sav. Mch. Co., Phila

Shafting
Camden Forge Co., Camden.
Columbia Steel & S. Co., Pittsburgh
Royersford Fdry. & Mch. Co., Royersford
Strand & Co., N. A., Chicago
Union Drawn Steel Co., Beaver Falls.

Shafts, Crank and Jack
Standard Gauge Steel Co., Beaver Falls.

Shafts, Flexible
Strand & Co., N. A., Chicago.

Shapes, Cold-Drawn Special Steel
Columbia Steel & Shaft Co., Pittsburgh
Frasse & Co., Peter A., N. Y.
New England Drawn S. Co., Mansfield.
Union Drawn S. Co., Beaver Falls

Shaping Machines
American Tool Wks. Co., Cincinnati
Cochrane-Bly Co., Rochester.
Columbia Mch. Tool Co., Hamilton.
Davis Mch. Tool Co., Rochester.
Gould & Eberhardt, Newark.
Hendey Mch. Co., Torrington
Herbert, Alfred, N. Y.
Kelly Co., R. A., Xenia, O.
Lynd Farquhar Co., Boston
Morton Mfg. Co., Muskegon Hgts.
Newton Mch. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Oakley Mch. Tool Co., Cincinnati.
Ohio Mch. Tool Co., Kenton.
Potter & Johnston Mch. Co., Pawtucket.
Rhodes Mfg. Co., Hartford
Russell Holbrook & Henderson, N. Y.
Sellew Mch. Tool Co., Pawtucket.
Smith & Mills Co., Cincinnati
Springfield Mch. T. Co., Springfield
Stockbridge Mch. Co., Worcester.
Streine Tool & Mfg. Co., New Bremen
Strong, Carlisle & Hammond Co., Cleveland.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago.
Oliver Mfg. Co., O. O., Buffalo
Tucker, W. A. & C. F., Hartford

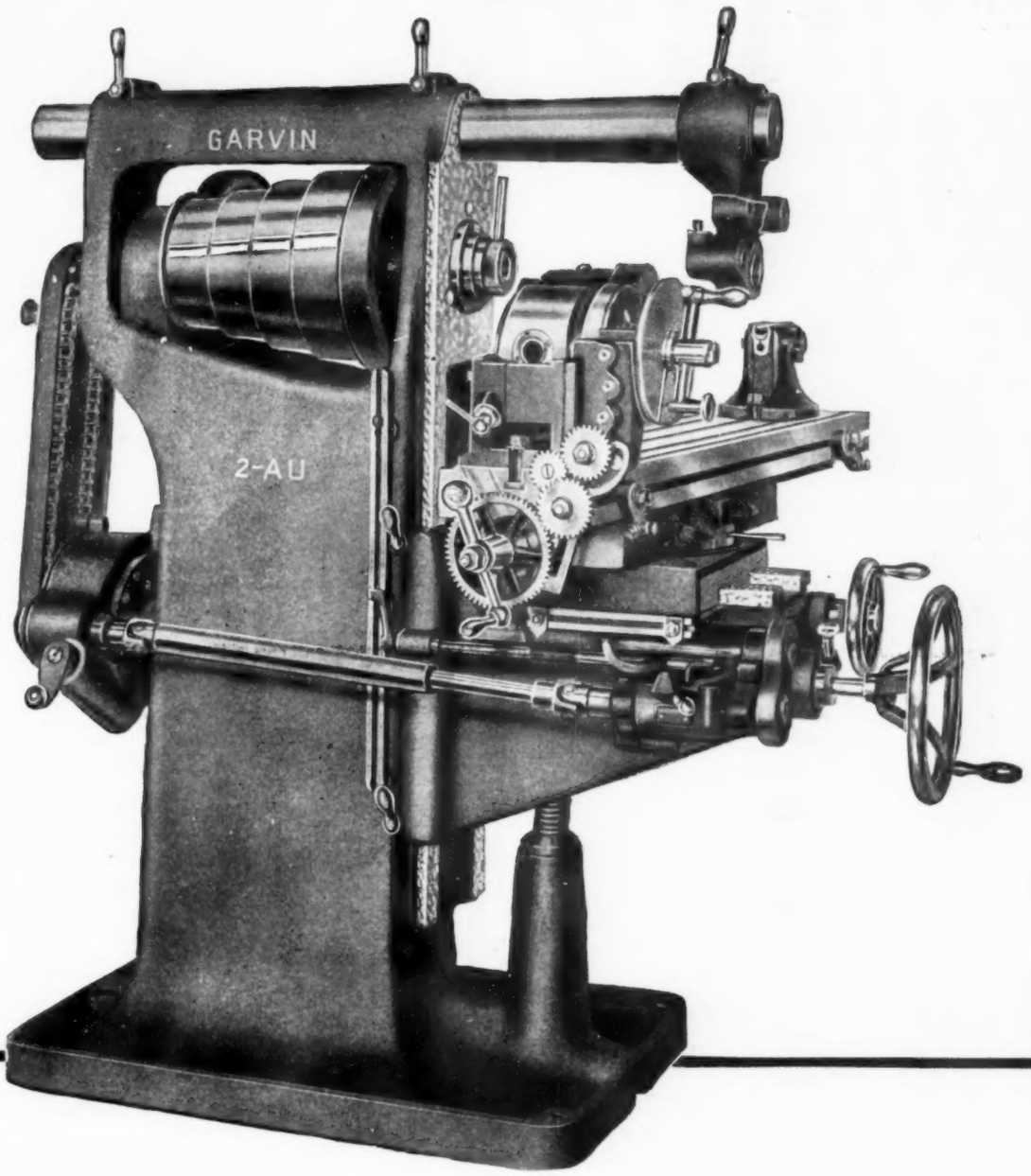
Shears, Power
Birdsboro Steel F. & M. Co., Birdsboro
Cleveland (O.) Punch & Shear Wks.
Ferracute Mach. Co., Bridgeton
Hilles & Jones Co., Wilmington
Niagara Mch. & Tool Wks., Buffalo
Stoll Co., D. H., Buffalo.
Toledo Mch. & Tool Co., Toledo
Sheet Metal Working Machinery
Ferracute Mach. Co., Bridgeton
Long & Allstatter Co., Hamilton, O
Niagara Mch. & Tool Wks., Buffalo
Royersford Fdry. & Mch. Co., Royersford
Savage Co., W. J., Knoxville
Toledo Mch. & Tool Co., Toledo

Shelving, Steel (See Furniture, Machine Shop)

Shims
Laminated Shim Co., N. Y.

Slotting Machines
Betts Machine Co., Rochester.
Cochrane-Bly Co., Rochester
Dill Mach. Co., T. C., Philadelphia
Garvin Mach. Co., N. Y.
Herbert, Alfred, N. Y.
Newton Mach. Tool Wks., Phila.
Sellers & Co., Wm., Phila

GARVIN MACHINE TOOLS



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6-16

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Sockets and Sleeves
Clark Equipment Co., Buchanan.
Detroit Twist Drill Co., Detroit
Lincoln Twist Drill Co., Taunton.
Pratt & Whitney Co., Hartford.
Standard Tool Co., Cleveland.

Special Machinery and Tools
American Mch. & Fdry. Co., Bklyn.
Automatic Eng. Co., N. Y.
Becker Milling Mach. Co., Hyde Park
Betts Mach. Co., Rochester.
Bicknell-Thomas Co., Greenfield.
Bilgram Mch. Wks., Philadelphia.
Boston Scale & Mch. Co., Boston.
Brown & Sharpe Mfg. Co., Providence.
Coats Mach. Tool Co., N. Y.
Columbus Die T. & M. Co., Columbus.
Cowdrey Mch. Wks., C. H., Fitchburg.
Davis-Bournonville Co., Jersey City.
Earle Gear & Mach. Co., Phila.
Fischer Mch. Co., Philadelphia
Franklin Mch. Co., Providence.
Garvin Mch. Co., N. Y.
Gem City Mch. Co., Dayton.
Geometric Tool Co., New Haven
Gisholt Mach. Co., Madison.
Greenfield T. & D. Corp., Greenfield
Grover File Co., Nashua.
Hartford Special Mchy. Co., Hartford.
Hoefer Mfg. Co., Freeport, Ill.
Horstmann Co., F. W., Irvington
Lambert & Todd Mch. Co., Camden.
Langelier Mfg. Co., Arlington.
Lincoln Mch. Co., Pawtucket.
Marvin & Casler Co., Canastota.
Mehl Mach. T. & D. Co., Roselle.
Meisel Press Mfg. Co., Boston.
Moback T. & M. Mfg. Co., Boston.
Nazel Eng. & Mch. Wks., Phila.
Newton Mch. T. Wks., Phila.
Peerless Mch. Co., Racine.
Robbins, Gamwell & Co., Pittsfield.
Rowbottom Mch. Co., Waterbury.
Service Co., N. Y.
Sheffield Mch. & Tool Co., Dayton.
Simplex Tool Co., Woonsocket.
Sloan & Chace Mfg. Co., Newark.
Steele Co., W. M., Worcester.
Sterling Specialty Co., Newcomerstown.
Taft-Peirce Mfg. Co., Woonsocket.
Terkelsen & Wennberg, Boston.
Underwood Corp., H. B., Phila.
Wade-American Precision Tool Co., Boston.
Waltham Mch. Wks., Waltham.
Whiting & Comstock, Hartford.

Springs
Barnes, Co., Wallace, Bristol
Reliance Spring & Mfg. Co., Bklyn.

Sprockets and Chains
Baldwin Chain & Mfg. Co., Worcester.
Bilgram Mch. Wks., Philadelphia.
Boston Gear Wks., Norfolk Downs.
Caldwell & Son Co., H. W., Chicago.
Cullman Wheel Co., Chicago.
Grant Gear Wks., Boston.
Link-Belt Co., Chicago, Philadelphia
Meisel Press Mfg. Co., Boston.
Morse Chain Co., Ithaca.
Morton, Thomas, N. Y.
Philadelphia Gear Wks., Phila.
Whitney Mfg. Co., Hartford.

Squares
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol.

Stampings, Metal
Acklin Stamping Co., Toledo, O.
American Pulley Co., Philadelphia.
Bay State Stamp. Co., Worcester.
Beaver Mach. & Tool Co., Newark.
Blum & Co., Julius, N. Y.
Detroit Stamp. Co., Detroit.
Gem Mfg. Co., Pittsburgh.
Kales Stamp. Co., Detroit, Mich.
New Britain Mch. Co., New Britain.
Reliance Spring & Mfg. Co., Bklyn.
Worcester Pressed S. Co., Worcester

Stamps, Steel
Hoggson & Pettis Mfg. Co., New Haven.
Noble & Westbrook Mfg. Co., Hartford.
Pannier Bros. Stamp. Co., Pittsburgh.

Stanchions, Machine Guard & Guard Rail
New Britain Mch. Co., New Britain

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence.
Eclipse Fuel Eng. Co., Rockford.

Steel, Cold Rolled Strip
Blum & Co., Julius, N. Y.
Cyclops Steel Co., N. Y.
Hawkridge Bros. Co., Boston.

Steel Hardness Measuring Instruments
Shore Instrument & Mfg. Co., N. Y.

Steel Scrap Reclamation
Onondaga Steel Co., Syracuse.

Steel, Shafting and Free Cutting Screw
Blum & Co., Julius, N. Y.
Columbia Steel & Shaft. Co., Pittsburgh
Cyclops Steel Co., N. Y.
Hawkridge Bros. Co., Boston.
New England Drawn S. Co., Mansfield.
Union Drawn S. Co., Beaver Falls.

Steel, Sheet
Boker & Co., H., N. Y.
Colonial Steel Co., Pittsburgh.
Hawkridge Bros. Co., Boston.
Hobson, Houghton & Co., N. Y.
Jessop & Sons, William, N. Y.
Ward's Sons, Edgar T., Boston.

Steels, Alloy Carbon
Boker & Co., H., N. Y.
Buffalo Forge Co., Buffalo.
Cyclops Steel Co., N. Y.
Firth-Sterling Steel Co., McKeesport
Federal T. & Alloy S. Corp., N. Y.
Halcomb Steel Co., Syracuse
Hawkridge Bros. Co., Boston.
Hess Steel Corp., Baltimore.
Hobson, Houghton & Co., N. Y.
Jessop & Sons, Wm., N. Y.
Latrobe Elec. Steel Co., Latrobe.
Ludlum Steel Co., Watervliet.
Midvale Steel & Ordnance Co., Phila.
Onondaga Steel Co., Syracuse.
Vanadium Alloys S. Co., Pittsburgh
Vulcan Crucible S. Co., Alliquippa.
Ward's Sons, Edgar T., Boston.
Western Tool & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn.

Steels, High Speed
Armstrong Bros. Tool Co., Chicago.
Atlas Crucible Steel Co., Dunkirk.
Boker & Co., H., N. Y.
Colonial Steel Co., Pittsburgh.
Cyclops Steel Co., N. Y.
Firth-Sterling S. Co., McKeesport.
Halcomb Steel Co., Syracuse
Hawkbridge Bros. Co., Boston.
Herbert, Alfred, N. Y.
Hess Steel Corp., Baltimore.
Hobson, Houghton & Co., N. Y.
Jessop & Sons, Wm., N. Y.
Latrobe Elec. Steel Co., Latrobe.
Le Moyne Steel Co., Pittsburgh.
Ludlum Steel Co., Watervliet.
Midvale Steel & Ordnance Co., Phila.
Onondaga Steel Co., Syracuse.
Vanadium Alloys Co., Pittsburgh.
Vulcan Crucible S. Co., Aliquippa.
Ward's Sons, Edgar T., Boston.
Williams & Co., J. H., Brooklyn.

Steel, Stainless
American Stainless Steel, Pittsburgh

Stools, Shop
Manufacturing Equip. & Eng. Co., Framingham.
New Britain Mch. Co., New Britain

Straightening Machinery
Hilles & Jones Co., Wilmington.
Medart Patent Pulley Co., St. Louis
Shuster Co., F. B., New Haven.
Springfield Mch. Tool Co., Springfield, O.
Standard Eng. Wks., Pawtucket.

Stud Setters, Opening
Errington, F. A., N. Y.
Subpresses and Dies
Waltham Mach. Wks., Waltham.

Supplies, Factory & Mill
Hammacher, Schlemmer & Co., N. Y.

Surface Plates
Simplex Tool Co., Woonsocket.

Swaging Machines
Langelier Mfg. Co., Arlington.
Torrington Co., Torrington.

Switches and Switchboards
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Tachometers
Bristol Co., Waterbury.
Brown Instrument Co., Philadelphia
Jones-Motrola, N. Y.
Tanks & Pumps, Oil
Bowser & Co., S. F., Ft. Wayne.

Tap Extensions
Allen Mfg. Co., Hartford.

Tap Holder
Bay State Tap & Die Co., Mansfield
Bicknell-Thomas Co., Greenfield.
Errington, F. A., N. Y.
Gisholt Mch. Co., Madison.
Greenfield T. & D. Corp., Greenfield
Jarvis Co., Chas. L., Gildersleeve.

Taper Pins
Brown & Sharpe Mfg. Co., Providence.
Pratt & Whitney Co., Hartford.
Standard Tool Co., Cleveland

Tapes, Measuring
Starrett Co., L. S., Athol.

Tapping Machines and Attachments
Acme Mchy. Co., Cleveland.
American T. Wks. Co., Cincinnati
Baker Bros., Toledo.
Beaman & Smith Co., Providence.
Bicknell-Thomas Co., Greenfield.
Carlton Mch. Tool Co., Cincinnati.
Cincinnati (O.) Bickford Tool Co.
Dorman & Sons, John H., N. Y.
Errington, F. A., N. Y.
Evans Stamp. & Plat. Co., Taunton
Fairbanks Morse Co., N. Y.
Garvin Mach. Co., N. Y.
Geometric Tool Co., New Haven.
Harrington, Son & Co., Ed., Phila.
Hoefer Mfg. Co., Freeport, Ill.
Jarvis Co., Charles L., Gildersleeve
Langelier Mfg. Co., Arlington.
Lowenstein Radio Co., Brooklyn.
Moline Tool Co., Moline.
National Mchy. Co., Tiffin.
Rickert-Shafer Co., Erie.
Sloan & Chace Mfg. Co., Newark.
Turner Machine Co., Danbury.

Taps and Dies
Advance Tool Co., Cincinnati
Bay State T. & D. Co., Mansfield.
Bignall & Keeler Mch. Wks., Edwardsville.
Brubaker & Bros., W. L., N. Y.
Butterfield & Co., Derby Line.
Card Mfg. Co., S. W., Mansfield.
Gardner-Bryan Co., Cleveland.
Greenfield T. & D. Corp., Greenfield
Hammacher, Schlemmer & Co., N. Y.
Herbert, Alfred, N. Y.
Landis Mach. Co., Waynesboro.
Morse Twist D. & M. Co., New Bedford.
Murchey M. & T. Co., Detroit.
National Acme Co., Cleveland.
National Tool Co., Cleveland.
Pratt & Whitney, Hartford.
Reed Mfg. Co., Erie.
Saunders Sons, D., Yonkers.
Standard Tool Co., Cleveland
Winter Bros. Co., Wrentham.

Taps, Collapsing
Eastern Mach. S. Corp., N. Haven.
Errington, F. A., N. Y.
Geometric Tool Co., New Haven.
Manufacturers Equip. Co., Chicago.
Murchey M. & T. Co., Detroit.
Victor Tool Co., Waynesboro.
Testing Metals and Materials
Southern Eng'r. Corp., N. Y., Hartford.

Thermometers
Bristol Co., Waterbury.
Brown Instrument Co., Phila.
Eclipse Fuel Eng. Co., Rockford.
Englehard, Charles, N. Y.
Taylor Instrument Co., Rochester
Thwing Instrument Co., Phila.

Thread-Cutting Tools
Eastern Mach. Screw Corp., New
Geometric Tool Co., New Haven.
Greenfield T. & D. Corp., Greenfield
Jones & Lamson Mch. Co., Springfield.
Landis Mach. Co., Waynesboro.
Modern Tool Co., Erie, Pa.
Murchey M. & T. Co., Detroit.
Pratt & Whitney Co., Hartford.
Rivett Lathe & Grinder Co., Boston
Union Tool Co., Orange.
Williams & Co., J. H., Brooklyn.

Thread Grinding Attachments
Precision & T. G. Mfg. Co., Phila.

Threading Machines
Automatic Mach. Co., Bridgeport.
Eastern Mach. S. Corp. N. Haven.
Geometric Tool Co., New Haven.
Greenfield T. & D. Corp., Greenfield
Hall Planetary Thread Milling Mch. Co., Philadelphia.
Landis Mach. Co., Waynesboro.
Lees-Bradner Co., Cleveland.
National Acme Co., Cleveland.
National Machy. Co., Tiffin.
Universal Mch. Co., Bowling Green

Thread Lead Testing Machinery
Bicknell-Thomas Co., Greenfield.

Thread Rolling Machines
National Machinery Co., Tiffin.

Tool Cases
Federal Products Corp., Providence
Gerstner & Sons, H., Dayton.

Tool Holders
Armstrong Bros. Tool Co., Chicago.
Bay State T. & D. Co., Mansfield.
Clark Equipment Co., Buchanan.
Gisholt Mach. Co., Madison.
Herbert, Alfred, N. Y.
Lovejoy Tool Co., Springfield, Vt.
Pratt & Whitney Co., Hartford.
Union Tool Co., Orange.
Western Tool & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn.
Tool Posts, Lathe
Armstrong Bros. Tool Co., Chicago.

Tool Work
Acme Elect. & Mfg. Co., Cleveland
Advance Tool Co., Cincinnati.
American M. & F. Co., Brooklyn.
Ames Co., B. C., Waltham.
Beaver Mach. & Tool Co., Newark.
Becker Milling Mch. Co., Hyde Park.
Bicknell-Thomas Co., Greenfield.
Bishop Machine Co., N. Y.
Boston Scale & Mach. Co., Boston.
Budd & Ranney Engr. Co., Cleveland.
Buffalo Pitts Co., Buffalo.
Carpenter Mfg. Co., E. W., Bridgeport.
Columbus (O.) Die T. & M. Co.
Cowdrey Mch. Wks., C. H., Fitchburg.
Detroit Stamping Co., Detroit.
Ferracute Mach. Co., Bridgeton.
Frostholm Bros., Syracuse.
Gem City Mach. Co., Dayton.
General Ordnance Co., Derby
Gisholt Mch. Co., Madison.
Grant Mfg. & Mach. Co., Bridgeport.
Greenfield T. & D. Corp., Greenfield
Hartford Special Mchy. Co., Hartford.
Lincoln Mch. Co., Pawtucket.
Lowenstein Radio Co., Brooklyn.
Marvin & Casler Co., Canastota.
Mehl Mach. T. & D. Co., Roselle.
Moback T. & M. Mfg. Co., Boston.
Modern Tool D. M. Co., Columbus.
Nestor Mfg. Co., N. Y.
Potter Tool & Mach. Wks., N. Y.
Rowbottom Mch. Co., Waterbury.
Service Eng. Co., N. Y.
Sheffield Mch. & Tool Co., Dayton.
Simplex Tool Co., Woonsocket.
Sloan & Chace Mfg. Co., Newark.
Slocomb Co., J. T., Providence.
Starrett Co., L. S., Athol.
Steele Co., W. M., Worcester.
Superior Tool & Die Co., Chicago.
Taft-Peirce Mfg. Co., Woonsocket.
Tait-Marston Eng. Co., Boston
Terkelsen & Wennberg, Boston.
Toledo Mch. & Tool Co., Toledo.
Union Tool Co., Orange.
Wade-American Precision Tool Co., Boston.
Walker Co., O. S., Worcester.
Waltham Mch. Wks., Waltham.
Weber & Scher Mfg. Co., Newark.
Whiting & Comstock, Hartford.

Tools, Small (See Machinists' Small Tools)

Torches, Blow
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Transformers
Crocker-Wheeler Co., Ampere.
General Electric Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Transmission Machinery
Caldwell & Son Co., H. W., Chicago
Fairbanks Co., N. Y.
Hyatt Roller Bearing Co., N. Y.
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Philadelphia
Moore & White Co., Phila.
Morse Chain Co., Ithaca
Rockwood Mfg. Co., Indianapolis.
Royersford Fdry. & Mch. Co., Royersford

Transportation System (See Trucks)

Trolleys and Tramways
Chisholm-Moore Mfg. Co., Cleveland.
Harrington, Son & Co., Ed., Phila.
Nuttall Co., R. D., Pittsburgh.
Shepard Elec. C. & H. Co., Montour Falls.
Whiting Fdry. Equip. Co., Harvey
Yale & Towne Mfg. Co., Stamford

Trucks
Barrett-Cravens Co., Chicago.
Cowan Truck Co., Holyoke
Fairbanks Co., N. Y.
Lewis-Shepard Co., Boston
New Britain Mch. Co., New Britain
Stuebing Truck Co., Cincinnati.
Transmission Ball Bearing Co., Buffalo
Whiting Fdry. Equip. Co., Harvey.

Tube Machinery, Seamless and Welded
Standard Eng. Wks., Ellwood City.

Tubing, Flexible
Almond Mfg. Co., T. R., Ashburnham.
Nuttall Co., R. D., Pittsburgh
Titeflex Metal Hose Corp., Newark.

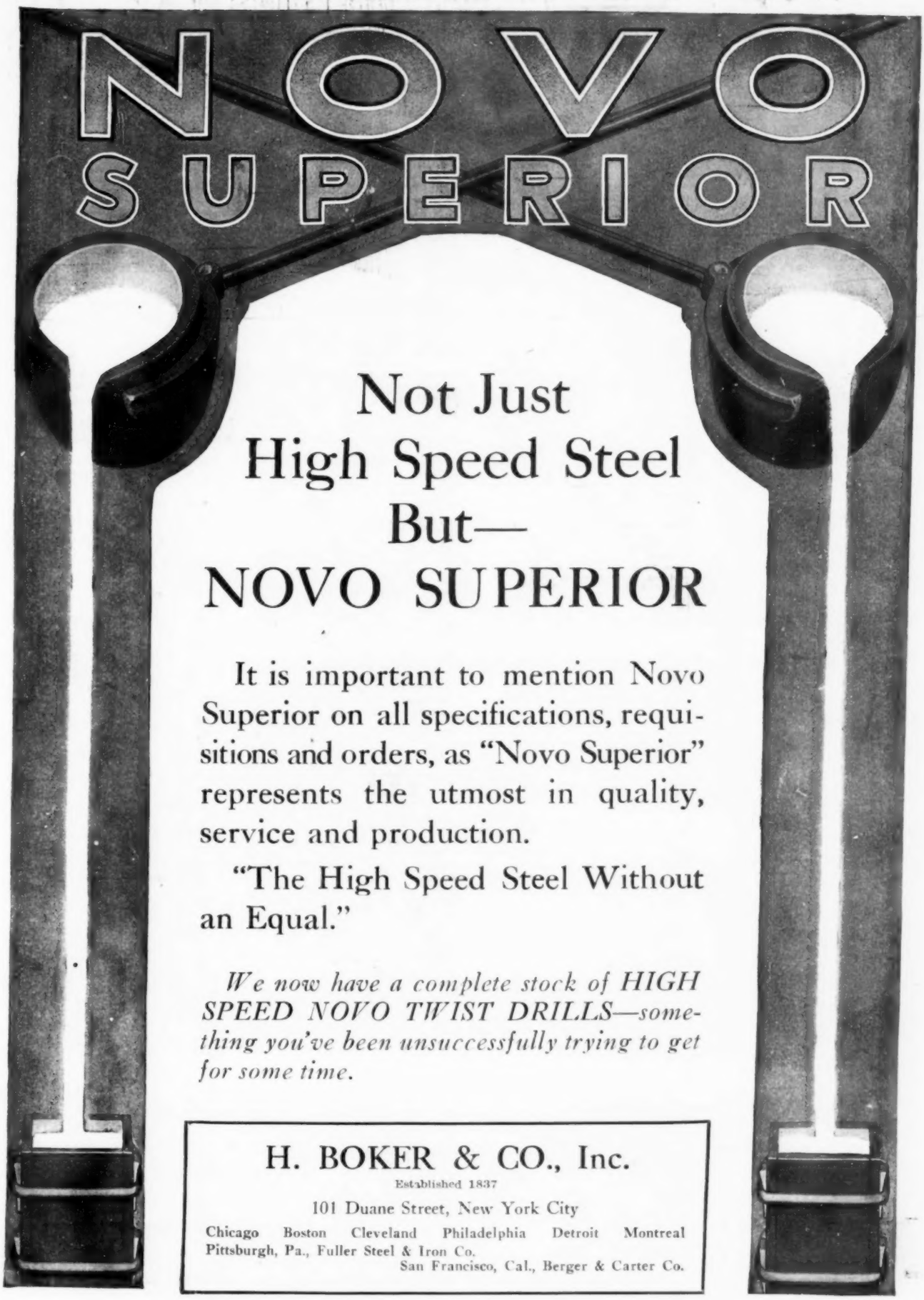
Tubing, Seamless Steel, Brass and Copper
Blum & Co., Julius, N. Y.
Ward's Sons, Edgar T., Boston.

Turret Heads
Almond Mfg. Co., T. R., Ashburnham.

Turret Machines (See Lathes, Horizontal Turret)

Turrets, Tool Post
American T. Wks. Co., Cincinnati
Phoenix Mfg. Co., Eau Claire.

Unions, Pipe
Dart Mfg. Co., E. M., Providence.



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San Francisco, Cal., Berger & Carter Co.

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Bearings Co. of America, Lancaster
Gray & Prior Mch. Co., Hartford.
Universal Mch. Co., Bowling Green

Valves
Elmes Eng. Wks., Chas. F., Chicago
Fairbanks Co., N. Y.
Watson-Stillman Co., N. Y.

Varnishes
Hilo Varnish Corp., Brooklyn.

Vise Stands
New Britain Mach. Co., N. Britain.
Western T. & Mfg. Co., Springfield, O.

Vises, Drilling Machine
Armstrong-Blum Mfg. Co., Chicago.
Armstrong Bros. Tool Co., Chicago.
Brown Eng. Co., Reading.
Cochrane-Bly Co., Rochester.
Graham Mfg. Co., Providence.
Hartford Special Mchy. Co., Hartford.
Hoggson & Pettis Mfg. Co., New Haven.
Horton & Son Co., E., Windsor Lks.
Nestor Mfg. Co., N. Y.
Sanford Mfg. Co., F. C., Bridgeport.
Sprague-Hayes Mchy. Co., Detroit.

Vises, Metal Workers'
Athol Machine Co., Athol, Mass.
Fox Machine Co., Jackson.
Hammacher, Schlemmer & Co. N. Y.
Hollands Mfg. Co., Erie
New Britain Mch. Co., New Britain
Reed Mfg. Co., Erie.
Thomas Elevator Co., Chicago
Western Tool & Mfg. Co., Springfield, O.

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence.
Cincinnati (O.) Milling Mch. Co.
Cleveland (O.) Milling Mch. Co.
Cochrane-Bly Co., Rochester.
Greenfield T. & D. Corp., Greenfield
Hartford Special Mchy. Co., Hartford.
Moback T. & Mch. Mfg. Co., Boston
Nestor Mfg. Co., N. Y.
New Britain T. & M. Co., New Britain.
Sanford Mfg. Co., F. C., Bridgeport.
Standard Eng. Wks., Pawtucket.

Vises, Pipe
Athol Mach. Co., Athol.
Butterfield & Co., Derby Line.
Greenfield T. & D. Corp., Greenfield
Reed Mfg. Co., Erie.
Saunders Sons, D., Yonkers.
Western T. & Mfg. Co., Springfield, O.
Williams & Co., J. H., Brooklyn.

Vises, Planer and Shaper
American Tool Wks. Co., Cincinnati
Cincinnati Planer Co., Cincinnati.
Cleveland (O.) Milling Mch. Co.
Graham Mfg. Co., Providence.
Hartford Special Mchy. Co., Hartford.
Hendey Mach. Co., Torrington.
Hoggson & Pettis Mfg. Co., New Haven.
Moback T. & M. Mfg. Co., Boston.
New Britain T. & M. Co., New Britain.
Sanford Mfg. Co., F. C., Bridgeport

Vises, Universal Machine
Brown & Sharpe Mfg. Co., Providence.
Cincinnati (O.) Milling Mach. Co.
Hartford Special Mchy. Co., Hartford.
Hoggson & Pettis Mfg. Co., New Haven.
Horton & Son Co., E., Windsor Lks.
Kempsmith Mfg. Co., Milwaukee
Moback T. & M. Mfg. Co., Boston.
Nestor Mfg. Co., N. Y.
New Britain T. & M. Co., New Britain.
Sanford Mfg. Co., F. C., Bridgeport
Skinner Chuck Co., New Britain.
Union Tool Co., Orange.

Vises, Wood Workers
Hammacher, Schlemmer & Co. N. Y.

Voltmeters
Bristol Co., Waterbury

Brown Instrument Co., Philadelphia
General Elec. Co., Schenectady.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Wagon Loaders
Link-Belt Co., Chicago, Phila.

Wash Stands and Bowls
Manufacturing Equip. & Eng. Co., Framingham.

Washers
Detroit Stamping Co., Detroit.
Kales Stamp. Co., Detroit.

Waste Cotton Wool
Royal Mfg. Co.

Welding, Electric
Federal Mch. & Welder Co., Warren.
General Electric Co., Schenectady.
Thomson Elec. Weld. Co., Lynn.
Thomson Spot Weld Co., Lynn.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Welding Filler Rods
Page Steel & Wire Co., N. Y.

Welding, Oxy-Acetylene
Davis-Bournonville Co., Jersey City.
Imperial Brass Mfg. Co., Chicago.
Linde Air Products Co., N. Y.

Welding Machines, Electric
Federal M. & W. Co., Warren.
General Electric Co., Schenectady.
Thomson Elec. Weld. Co., Lynn.
Thomson Spot Weld. Co., Lynn.
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City.
Milburn Co., Alexander, Baltimore.

Wire
Boker & Co., H., N. Y.
Gwilliam Co., N. Y.
Halcomb Steel Co., Syracuse.
Hammacher, Schlemmer & Co., N. Y.
Hawkridge Bros. Co., Boston.
Page Steel & Wire Co., N. Y.

Wires, Special
Driver-Harris Co., Harrison.

Wire-Straightening and Cutting Machinery
Rowbottom Mach. Co., Waterbury.
Shuster Co., F. B., New Haven.
Worthington P. & Mchy. Corp., N. Y.

Wire Welding
Federal Tool & Alloy Corp., N. Y
Page Steel & Wire Co., N. Y.

Wood Working Machinery
Blount Co., J. G., Everett.
New Britain Mach. Co., N. Britain.
Rowbottom Mach. Co., Waterbury.
Seneca Falls Mfg. Co., Seneca Falls.

Worm Cutting Machines
Lees-Bradner Co., Cleveland.

Worm Cutting Machines, Automatic
Bilton Mach. Tool Co., Bridgeport.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn.

Wrenches, Machinist
Hammacher, Schlemmer & Co., N. Y.
Trimont Mfg. Co., Roxbury.
Williams & Co., J. H., Brooklyn.

Wrenches, Pipe
Greenfield T. & D. Corp., Greenfield
Trimont Mfg. Co., Roxbury.
Williams & Co., J. H., Brooklyn.

Wrenches, Ratchet
Pratt & Whitney Co., Hartford.
Starrett Co., L. S. Athol.

Wrenches, Tap
Bay State T. & D. Co., Mansfield.
Butterfield & Co., Derby Line.
Card Mfg. Co., S. W., Mansfield.
Greenfield T. & D. Corp., Greenfield
Starrett Co. L. S., Athol.
Union Tool Co., Orange.
Williams & Co., J. H., Brooklyn.

ALPHABETICAL INDEX TO ADVERTISERS—Continued from page 356

	Page
Onondaga Steel Co., Inc.	194
Osborne & Sexton Machinery Co.	168, 315
Ott Grinder Co.	211
Page Steel & Wire Co.	194
Pangborn Corporation	178
Pannier Bros. Co., Inc.	169
Pawling & Harnischfeger Co.	242
Paxson Co., J. W.	290
Pedrick Tool & Machine Co.	231
Peerless Machine Co.	261
Persons-Arter Machine Co.	210
Peter Bros. Mfg. Co.	250
Philadelphia Gear Works	252
Phoenix Mfg. Co.	238
Pittsburgh Mach. Tool Co.	76
Platt Iron Works	306
Positions Vacant and Wanted	324c
Potter & Johnston Machine Co.	20, 21
Potter Tool & Machine Works, S. A.	241
Powell Machine Co.	165
Pratt Chuck Co.	246
Pratt & Whitney Co.	3
Precision & Thread Grinder Mfg. Co.	199
Prentiss & Co., Henry	311
Production Machine Co.	211
Purinton & Smith	316
Quick Change Chuck Mfg. Co., The	246
Racine Tool & Machine Co.	263
Ransom Mfg. Co.	174
Reading Chain & Block Corp.	222
Reed Mfg. Co.	267
Reed-Prentice Co.	120, 121
Reliance Electric & Engineering Co.	174
Reliance Machinery Sales Co.	313
Reliance Spring & Manufacturing Co.	174
Reliance Steel & Tool Co.	286
Republic Creosoting Co.	199
Rhodes Mfg. Co.	164
Rich Tool Co.	290
Richmond Forgings Corp.	318
Rickert-Shafer Co.	150
Rivett Lathe & Grinder Co.	130, 131, 132, 133, 3rd Cover
Robbins, Gamewell & Co.	335
Rockford Drilling Machine Co.	149
Rockford Lathe & Drill Co.	240
Rockford Tool Co.	251
Rockwood Mfg. Co.	223
Romaine Mchy. Co., W. I.	316
Rossendale-Reddaway Belting & Hose Co.	218
Rothschild R.	314
Rowbottom Machine Co.	159
Royersford Fdry. & Mach. Co., Inc.	262
Russell, Holbrook & Henderson Inc.	207
Russell Mach. Co., Inc.	315
Ryerson & Son, Joseph T.	1-7
Safety Emery Wheel Co.	208
Sanford Mfg. Co., F. C.	264
Saunders Sons, D.	166
Savage, W. H.	315
Savage Co., W. J.	265
Saxer Machinery Co.	314
Schatz Mfg. Co.	226
Schieren Co., Chas. A.	220
Schoonmaker & Sons, Inc., A. G.	317
Scully-Jones Co.	250
Searchlight Section	293
Selfcent Woodruff Co.	318
Sellers & Co., Inc., Wm.	215
Sellew Machine Tool Co.	168
Seneca Falls Mfg. Co., Inc.	105
Service Engineering Co.	334
Seyferts Sons Co., L. F.	313
Sheffield Machine & Tool Co.	330
Shepard Elec. Crane & Hoist	219
Shepherd Engineering Co.	335
Shore Instrument & Mfg. Co.	271
Shuster Co., F. B.	182
Sidney Machine Tool Co., The	146
Simmons Machine Co.	207, 309
Simonds Mfg. Co., Fitchburg	263
Simonds Mfg. Co., Pittsburgh	258
Simplex Tool Co.	328
Sipp Machine Co.	232
SKF Industries, Inc.	29
Skelton Tool Co.	290
Skinner Chuck Co.	248
Sloan & Chace Mfg. Co.	163
Slocomb Co., J. T.	124, 125
Smalley General Co., Inc.	161
Smith & Mills Co., Th.	168
Smith & Serrell	222
Smooth-On Mfg. Co.	197
South Bend Lathe Works	241
Souther Engineering Co., Henry	251
Spaulding-Moss Co.	242
Sprague-Hayes Mfg. Co.	235
Springfield Auto. Screw Mach. Corp.	110
Springfield Machine Tool Co.	28
Stamets, Wm. B.	213
Standard Electric Tool Co.	182
Standard Engr. Co., Ellwood C. F.	168
Standard Eng. Works, Pawtucket	167
Standard Gauge Steel	191
Standard Machinery Co.	315
Standard Tool Co.	288
Starrett Co., L. S.	117
Stark Tool Co.	241
Steele Co., W. M.	329
Steel Treating Equipment Co.	194
Steinle Turret Machine Co.	48
Sterling Grinding Wheel Co.	213
Sterling Specialty Co.	198
Stewart Mfg. Corp.	201
Stickley Machinery Co., E. B.	317
Stockbridge Machine Co., The	168
Stocker, Rumely, Wachs Co.	312
Stoll Co., The D. H.	278
Stow Mfg. Co., Inc.	182
Strand & Co., N. A.	181
Streine Tool & Mfg. Co.	213
Strong, Carlisle & Hammond Co.	77
Stuebing Truck Co.	222
Sullivan Machinery Co.	181
Superior Corundum Wheel Co.	266
Sweet & Doyle Fdry. & Mach. Co.	335
Swind Machinery Co.	262
Taft-Peirce Mfg. Co.	144
Taft-Marston Engineering Co.	328
Tate, Jones & Co., Inc.	203
Taylor & Fenn Co.	265
Taylor Instrument Co.	269
Technical Products Co.	298
Terkelsen & Wennberg	251
Texas Co., The	255
Thomas Elevator Co.	245
Thompson & Son Co., Henry G.	264
Thomson Electric Welding Co.	190
Thomson Spot Welder Co.	191
Thurston Mfg. Co.	162
Thwing Instrument Co.	270
Titeflex Metal Hose Corp.	222
Tock Screw Mach. Products Corp.	329
Toledo Machine & Tool Co.	276
Toledo Milling Mach. Co.	143
Toomey, Inc., Frank	305
Torrington Co., The	196
Townsend Mfg. Co., H. P.	182
Trahern Pump Corp.	274
Transmission Ball Bearing Co., Inc.	223
Trimont Mfg. Co.	278
Tucker, W. A., & C. F.	265, 278
Turner Machine Co.	235
Underwood Corp., H. B.	169
Union Drawn Steel Co.	196
Union Gear & Machine Co.	258
Union Lathe Works	241
Union Mfg. Co.	250
Union Mfg. Co.	335
Union Tool Co.	271
Union Twist Drill Co.	88, 89
U. S. Ball Bearing Co.	225
U. S. Electrical Tool Co.	174
United Hammer Co.	278
Universal Boring Machine Co.	231
Universal Grinding Machine Co.	205
Universal Instrument & Metal Co.	336
Universal Machine Co.	262
V and O Press Co.	270
Vanadium-Alloys Steel Co.	186
Vandyck Churchill Co.	264
Van Norman Machine Tool Co.	40, 41
Veeder Mfg. Co., The	268
Victor Saw Works	264
Victor Tool Co.	283
Vitrified Wheel Co.	209
Vixen Tool Co.	284
Volyum Pump Co.	274
Vonnegut Machinery Co.	317
Vulcan Crucible Steel Co.	197
Wade-American Tool Co.	240
Wahlstrom Tool Co.	242
Walker Co., O. S.	49
Walsh Machinery Co., M. J.	318
Waltham Machine Works	158
Want Ads	324c
Wards Sons Co., Edgar T.	190
Warner & Swasey Co.	106, 107
Watson-Stillman Co.	336
Wayne Machinery Co.	305
Weber & Scher Mfg. Co.	329
Wells, J. H.	335
West Haven Mfg. Co.	289
West Steel Castings Co.	197
West Tire Setter Co.	278
Western Tool & Mfg. Co.	266
Westinghouse Electric & Mfg. Co.	171
Wheel Trueing Tool Co.	281
Whitcomb-Blaisdell Mch. Tool Co.	22, 23
White & Bagley Co., The	272
White Heat Products Co.	197
Whiting & Comstock	271
Whiting Foundry Equipment Co.	222
Whitney & Son, Baxter D.	213
Whitney Mfg. Co.	113
Whiton Machine Co., D. E.	250
Wickes Bros.	260
Wickes Machinery Co.	312
Willard Machine Tool Co.	237
Williams & Co., J. H.	284
Williams & Son, E. A.	195
Wilmarth & Morman Co.	209
Wilmington Fibre Specialty Co.	242
Winter Bros. Co.	103
Winterer, Herman L.	309
Wisconsin Electric Co.	173
Wisconsin Miller Mfg. Co.	167
Wood Turret Machine Co.	240
Woods Engineering Co.	202
Woodward & Powell Planer Co.	165
Worcester Pressed Steel Co.	197
Yale & Towne Mfg. Co.	222
Zarem & Rose	334
Zelnicker Supply Co., W. A.	313

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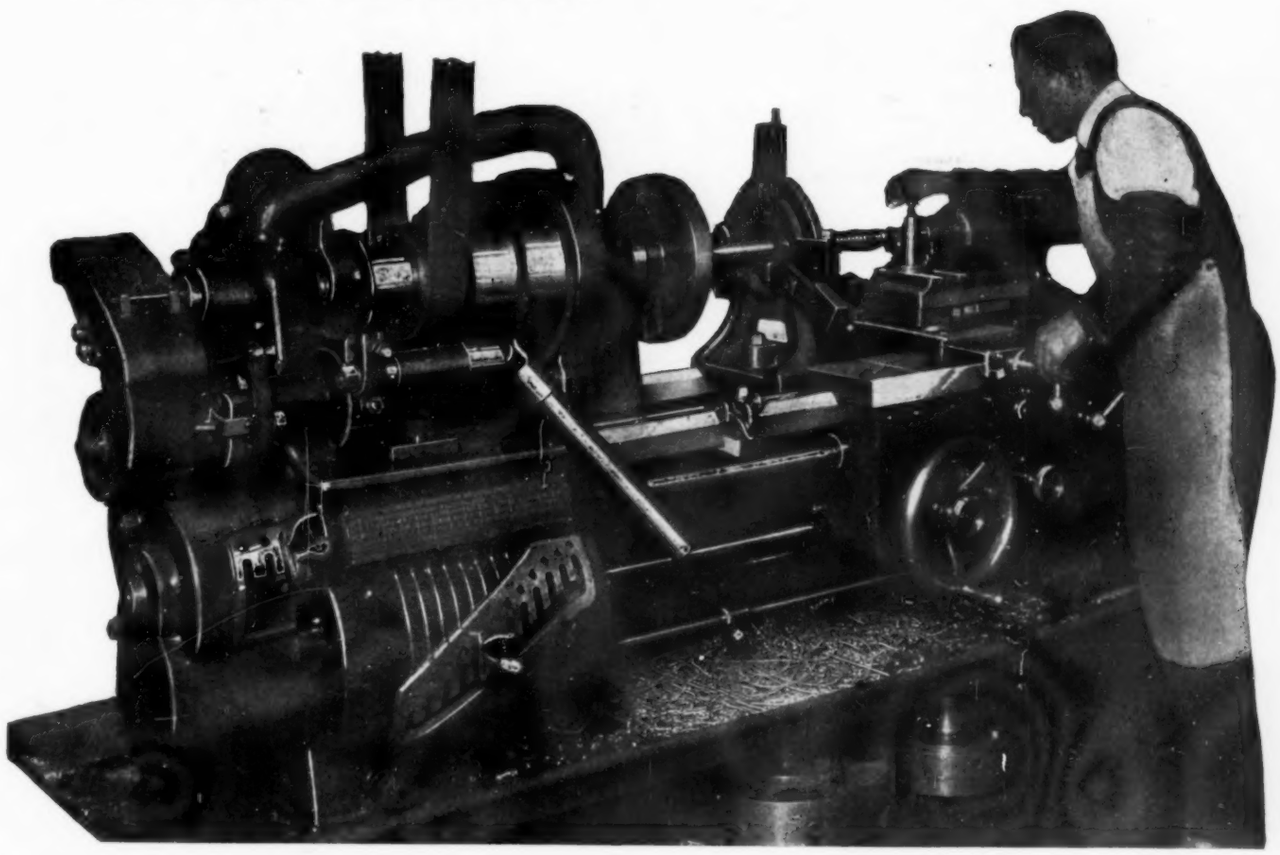

HENDEY

ALPHABETICAL INDEX TO ADVERTISERS

	Page
Abbott Ball Co.	223
Abrasive Machine Tool Co.	204
Acklin Stamping Co.	333
Acme Die Casting Corp.	198
Acme Elec. & Mfg. Co.	332
Acme Machinery Co., The	264
Acme Machine Tool Co., The	52
Adams Co., The	71, 108
Adams Mfg. Co., O. R.	238
Advance Furnace & Eng. Co.	140
Advance Tool Co., The	285
Ajax Metal Co.	188
Akron Gear & Eng. Co.	290
Albaugh-Dover Co.	256
Albro-Clem Elevator Co.	290
Allen Mfg. Co.	337
Almond Mfg. Co., T. R.	251
American Bronze Corp.	4th Cover
American Chain Co.	201
American Gas Furnace Co.	203
American Galco, Inc.	273
American Instrument Works	335
American Lead Pencil Co.	142
American Machine Co.	250
American Machine & Fdry. Co.	335
American Machinery Exchange	308
American Pulley Co.	221
American Saw & Mfg. Co.	112
American Shipbuilding Co.	313
American Stainless Steel Co.	195
American Swiss File & Tool Co.	289
American Tool & Mfg. Co.	335
American Tool Works Co.	14, 15
American Twist Drill Co.	154
Ames Co., B. C.	239
Anderson Bros. Mfg. Co.	235, 336
Ansonia Mfg. Co.	334
Arguto Oilless Bearing Co.	278
Armstrong-Blum Mfg. Co.	265
Armstrong Bros. Tool Co.	86
Athol Machine Co.	267
Atkins & Co., E. C.	145
Atlas Crucible Steel Co.	193
Atlas Press Co.	278
Auburn Ball Bearing Co.	226
Automatic Machine Co., The	164
Avey Drilling Machine Co.	232
Axelson Machine Co.	240

Badger Tool Co.	210
Baird Pneumatic Tool Co.	179
Baker Brothers	166
Baldwin Chain & Mfg. Co.	222
Barber-Colman Co.	80, 81
Barbour, Love & Woodward	304
Barnes Co., W. F. & John	33
Barnes Co., Wallace	153
Barnes Drill Co., Inc.	234
Barnes, Wm. O.	210
Barnett Co., G. & H.	112
Barrett-Cravens Co.	222
Bath & Co., Cyril J.	302
Bay State Stamping Co.	273
Bay State Tap & Die Co.	339
Beal & Co., Joseph	312, 313
Beaman & Smith Co.	289
Bearings Co. of America, The	226
Beaver Machine & Tool Co.	334
Becker Milling Machine Co.	122
Bennett Machinery Co., G. L.	312
Bennett, W. R. Co., The	203
Besly & Co., Chas. H.	87
Best, Inc., W. N.	202
Betts Machine Co.	9, 39
Bickford & Co., H.	234
Bicknell-Thomas Co.	269
Bignall & Keeler Machine Works	163
Bilgram Machine Works	162
Billings & Spencer Co.	286
Bilton Mach. Tool Co.	285
Birdsboro Steel Foundry & Mach. Co.	223
Bishop Machine Co.	329
Black & Decker Mfg. Co.	175
Blair Tool & Machine Wks.	334
Blanchard Machine Co.	126
Bliss Co., E. W.	277
Blount Co., J. G.	210
Blum & Co., Julius	196
Boker & Co., Inc., H.	353
Bond Foundry & Machine Co.	216
Boston Gear Works	258
Boston Scale & Mach. Co.	268
Boston Tool & Mfg. Co., Inc.	271
Bosworth, W. H.	318
Botwink Bros.	310
Bowen Products Corp.	273
Bowser & Co., S. F.	272
Boye & Emmes Machine Tool Co.	343
Bradford Machine Tool Co.	5
Bradley & Son, C. C.	276
Brady Foundry Co., Jas. A.	335
Bristol Co.	Fourth Cover
Bristol Machine Tool Co.	166
Brock Jr. Tool & Mfg. Works, Arthur	331
Brown, Arthur S.	223
Brown Co., A. & F.	220
Brown Engineering Co.	212
Brown Instrument Co.	274
Brown & Sharpe Mfg. Co.	114, 115, 257
Brownell Machinery Co.	295
Brubaker & Bros., W. L.	156
Bryant Chucking Grinder Co.	55
Burkeye Engine Co.	174
Burkeye Twist Drill Co.	287
Budd-Ranney Engineering Co.	329
Buffalo Forge Co.	202
Buffalo Housewrecking Co.	310
Buffalo Pitts Co.	335
Builders Iron Foundry	208
Bullard Machine Tool Co.	72, 73, 74, 75, 247
Bunting Brass & Bronze Co.	189
Burroughs Baldwin Co.	316
Bury Compressor Co.	290
Butterfield & Co.	116

Cadillac Tool Co.	234
Caldwell & Son Co., H. W.	218
Canton Fdry. & Machine Co., The	223
Carborundum Co.	134, 135
Card Mfg. Co., S. W.	60, 61
Carlton Machine Tool Co., The	229
Carpenter Mfg. Co., E. W.	334
Carpenter-Tew Gear Co.	256
Carter & Hakes Mach. Co.	168
Chard Lathe Co.	238
Champion Tool Wks. Co.	54
Chicago Flexible Shaft Co.	200
Chicago Machine Tool Co.	166
Chicago Pneumatic Tool Co.	177
Chicago Rawhide Mfg. Co.	258
Chisholm-Moore Mfg. Co.	223
Churchill-Morgan-Crittsinger	160
Cincinnati Automatic Machine Co.	54
Cincinnati-Bickford Tool Co.	10, 11
Cincinnati Electrical Tool Co.	174
Cincinnati Gear Co.	257
Cincinnati Gear Cutting Machine Co.	64
Cincinnati Grinder Co., The	210
Cincinnati Lathe & Tool Co.	242
Cincinnati Milling Machine Co.	6, 7
Cincinnati Planer Co.	50, 51
Clark Jr. Electric Co., Inc., Jas.	174
Clark Equipment Co.	139
Cleveland Automatic Mach. Co.	26, 27
Cleveland Machine Tool Co.	169
Cleveland Milling Machine Co.	168
Cleveland Planer Co.	169
Cleveland Pneumatic Tool Co.	180
Cleveland Punch & Shear Co.	260
Clifton-Pratt Co.	315
Clough, R. M.	223
Coats Machine Tool Co., Inc.	274
Cochrane-Bly Co.	271
Colburn Machine Tool Co.	62, 63
Colonial Steel Co.	195
Colton Co., Arthur	157
Columbia Machine Tool Co., The	169
Columbia Steel & Shafting Co.	188
Columbus Brass Co.	336
Columbus Die, Tool & Machine Co.	334
Commercial Engineering Co.	336
Cone Automatic Mach. Co., Inc.	159
Contract Work	328
Cook Co., Asa S.	162
Cortland Grinding Wheel Co.	213
Cost-Cut Counterbore Co.	284
Cotton, Inc., H. W.	329
Cowan Truck Co.	270
Cowdrey Machine Works, C. H.	332
Cowles Tool Co.	282
Crafts & Co., Arthur A.	112
Crescent Belt Fastener Co.	221
Crocker-Wheeler Co.	174
Crofoot Gear Works	256
Cullman Wheel Co.	258
Cushman Chuck Co.	249
Cutter & Wood Supply Co.	287
Cyclops Steel Co.	193

Dale-Brewster Machinery Co., Inc.	228
Dallett Co., Thos. H.	336
Dalton Manufacturing Corp.	Front Cover
Dart Mfg. Co., E. M.	278
Dauber Kratsch Co.	230
Davenport Machine Tool Co.	168
Davis Boring Tool Co.	82
Davis-Bournonville Co.	196
Davis Machine Co., Inc., C. F.	290
Davis Machine Tool Co., Inc.	36
Day Machinery Co.	312
Defiance Machine Works	38
Delta File Works	290
Desmond-Stephan Mfg. Co.	211
Detroit Machine Tool Co.	289
Detroit Stamping Co.	202
Dexter Co., Inc., I. H.	223
Diamond Machine Co.	208
Diamond Saw & Stamping Works	264
Dickinson, Thomas L.	112
Dill Slotter People, The	83
Doehler Die-Casting Co.	198
Dorman & Son, John H.	235
Dreses Machine Tool Co.	104
Driver-Harris Co.	90
Duff Co., J. E.	317
DuPont Chemical Co.	299
Durant Mfg. Co.	271

E. H. Machine Co.	334
Earle Gear & Machine Co.	264
Eastern Machinery Co.	316
Eastern Machine Screw Corp.	84
Eastern Tube & Tool Co.	248
Eclipse Fuel Engineering Co.	194
Eddy Machinery Co., E. A.	316
Elgin Tool Works	240
Elmes Engineering Works, Chas. F.	279
Elwell Parker Electric Co.	112
Emery, A. H.	334
Englehard, Chas.	336
Engravers & Printers Machine Co.	199
Ericsson Screw Mach. Products Co.	334
Errington, F. A.	251
Evans Friction Cone Co.	222
Evans Stamping & Plating Co.	199

Fafnir Bearing Co., The	226
Fahnestock Engineering Co.	335
Fairbanks Co.	264
Fairbanks-Morse Co.	274
Fastfeed Drill & Tool Corp.	141
Fawcus Machine Co.	258
Federal Bearings Co.	227
Federal Machine & Welder Co.	192
Federal Machinery Sales Co.	314
Federal Tool & Alloy Steel Corp.	196
Fellows Gear Shaper Co.	16, 17
Ferracute Machine Co.	290
Firth Sterling Steel Co.	193
Fischer Machine Co.	161
Fitchburg Grinding Machine Co.	204
Fitchburg Machine Works	111
Flather & Co., Inc.	10a
Foote Bros. Gear & Machine Co.	254
Forbes & Myers	210
Ford Chain Block Co.	216
For Sale	293
Fosdick Machine Tool Co.	229
Foster Machine Co.	65, 66, 67
Fox Machine Co.	232
Francis & Co.	213
Franklin Die-Casting Corp.	198
Franklin Machine Co.	336
Fraser Co., Warren F.	345
Freidus & Co., B.	324
Froiland, Paul	314
Frontier Chuck & Tool Co.	290
Frostholm Bros.	334

Gammons Holman Co.	288
Ganschow Co., Wm.	256
Gardner-Bryan Co., The	290
Gardner Machine Co.	210
Garvin Machine Co.	251, 351
Garwood Bronze & Iron Works	202
Geier Co., The P. A.	276
Gelb & Co., J.	317
Gem City Machine Co.	334
Gem Mfg. Co.	272
General Electric Co.	170
General Machine Works	334
General Ordnance Co.	328
Geometric Tool Co., The	46, 47
Gerstner & Sons, H.	274
Giddings & Lewis Machine Tool Co.	58
Gisholt Machine Co.	91, 92, 93, 94
Gits Bros. Mfg. Co.	272
Gleason Works	158
Glenham Embro Co.	328
Goddard Tool Co.	95
Gooley & Edlund, Inc.	167
Gorton Machine Co., Geo.	199
Gould & Eberhardt	100, 101
Government Advertising	319 to 323
Graham Mfg. Co.	270
Grand Rapids Grinding Mach. Co.	209
Grant Gear Works, Inc.	256
Grant Machine Co.	180
Grant Tool & Gauge Co.	334
Graton & Knight Mfg. Co.	220
Graves Machinery Exchange	294
Gray Co., The G. A.	28
Gray & Prior Machine Co.	203
Greaves-Klusman Tool Co.	45
Greaves Machine Tool Co., The	240
Greenfield Machine Co.	210
Greenfield Tap & Die Corporation	155
Grover File Co.	287
Gurney Ball Bearing Co.	37
Gwilliam Co., The	223

H. C. D. Screw Machine Products Co.	328
H. P. Company	213
Halcomb Steel Co.	187
Hall Planetary Thread Mill. Mach. Co.	160
Hamilton Machine Tool Co.	32
Hammacher Schlemmer & Co.	343
Hammond Mfg. Co., The	234
Hampden Corundum Wheel Co.	210
Hannon, Finton Co.	310
Harrington Son & Co., Edw.	221, 228
Harris Bros. Co.	308
Hart Mfg. Co., R. A.	336
Hartford Special Machinery Co.	266, 335
Hawkridge Bros. Co.	197
Heald Machine Co.	31
Hendey Machine Co.	255
Henry & Wright Mfg. Co.	232
Herbert, Alfred	138
Hercules Mach. & Tool Co., Inc.	196
Hergi Mfg. Co.	210
Hess Steel Corporation	196
Hill, Clarke & Co., Boston	303
Hill, Clarke & Co., of Chicago	293
Hilles & Jones Co.	160
Hilliard Clutch & Machinery Co.	223
Hilo Varnish Corp.	273
Hobson, Houghton & Co., Ltd.	197
Hoefer Mfg. Co.	235
Hoggson & Pettis Mfg. Co.	248
Hollands Mfg. Co.	267
Holtzer Cabot Electric Co., The	172
Horsburgh & Scott Co.	258
Horstmann Co., F. W.	271
Horton & Sons Co., E.	230
Hub Eng. & Mchy. Co.	334
Hunter Saw & Machine Co.	264
Huribut-Rogers Machinery Co.	265
Hyatt Roller Bearing Co.	78, 79
Hydraulic Press Mfg. Co.	279

Ideal Machinery Co.	316
Ideal Tool & Mfg. Co.	288
Imperial Brass Mfg. Co.	196
Independent Pneumatic Tool Co.	180
Industrial Furnace Corp.	128, 129
Industrial Machinery Corp.	312
Ingersoll-Milling Machine Co.	8
Ingersoll-Rand Co.	176
International Machine Tool Co.	242
International Nickel Co.	196

Jacobs Mfg. Co.	244
Jarvis Co., Chas. L., The	233
Jessop & Sons, Inc., Wm.	193
Johansson, Inc., C. E.	268
Johnson Gas Appliance Co.	203
Johnson Machine Co., Carlyle	85
Johnson & Miller	269
Johnston & Jennings Co., The	336
Jones Fdry. & Mach. Co., W. A.	215
Jones & Lamson Machine Co.	12, 13, 112
Jones-Motrola, Inc.	270
Joyce Koebel Co.	213

K. M. Mfg. Co.	328
Kales Stamping Co.	169
Kearney & Trecker Co.	56
Kell Hock Sales Co.	285
Keller Mech. Engraving Co.	264
Kelley Co., R. A.	169
Kelly Reamer Co., The	275
Kempsmith Mfg. Co.	42, 43
Keystone Reamer & Tool Co.	288
King Optical Co., Julius	234
Kinsey Co., E. A.	315
Knight Machinery Co., W. B.	230
Knoeppel & Co., Inc., C. E.	213

Ladew Co., Inc., Edwin R.	214
Lamberg & Co., A.	303
Lambert & Todd Mach. Co.	336
Laminated Shim Co.	222
Landis Machine Co.	24
Landis Tool Co.	96, 97, 123
Langeller Mfg. Co.	274
Lapointe Co., J. N.	291
Lapointe Machine Tool Co.	136, 137
Larson, Henry M.	335
Latrobe Electric Steel Co.	184
Latrobe Tool Co.	151
LeBlond Machine Tool Co., The R. K.	35
Lees-Bradner Co., The	290
LeMoyne Steel Co.	197
Lehman Machine Co.	241
Leland-Gifford Co.	230
Lewis-Shepard Co.	222
Light Mfg. & Foundry Co.	199
Lincoln Machine Co.	335
Lincoln Twist Drill Co.	59
Linde Air Products Co.	341
Lindquist Engineering Works	289
Link-Belt Co.	217
Little Giant Co.	276
Lodge & Shipley Machine Tool Co.	4
Lovejoy Tool Co.	290
Lowenstein Radio Co.	328
Lucas Co., J. L.	300, 311, 318
Lucas Machine Tool Co.	68
Ludium Steel Co.	185
Lumen Bearing Co.	224
Lynd-Farquhar Co.	152, 302

McCabe Lathe & Machy. Corp., J. J.	69
McGraw-Hill Book Co., Inc.	243, 270
McMullen Machinery Co.	310
M. S. G. L. Co., Inc.	269
Machine Tool Eng. Co.	304
Machinery Forging Co., The	198
Maidhof & Ashton Inc.	318
Manufacturers Equipment Co.	249
Manufacturing Equipment & Engineering Co.	259
Manufacturers Machine Products Co.	283
Marshall & Huschart Machinery Co.	314
Marvin & Casler Co.	247
Massachusetts Oilless Bearings Co.	226
Maxf Grinding Wheels Corp.	211
Meacham Gear Corp.	253
Medart Patent Pulley Co.	220
Mehl Machine Tool & Die Co.	333
Meisel Press Mfg. Co.	258
Meisselbach-Cutueri Mfg. Co.	258
Metal Saw & Machine Co.	337
Metallo Gasket Co.	329
Metalwood Mfg. Co.	182
Michigan Machine Co.	274
Midvale Steel & Ordnance Co. (Cambria Steel Co)	183
Milburn Co., The Alex.	197
Miller Saw Trimmer Co.	212
Millholland Machine Co.	98, 99
Minster Machine Co.	233
Mobach Tool & Machine Mfg. Co.	282
Modern Machinery Exchange	308
Modern Tool Co.	347
Modern Tool Die & Machine Co.	336
Moline Tool Co.	234
Monarch Machine Tool Co.	236
Moore & White Co., The	218
Morey Co.	296, 314
Morris Machine Tool Co., The	234
Morse Chain Co.	222
Morse Twist Drill & Machine Co.	288
Morton Mfg. Co.	290
Morton, Thomas	220
Motch & Merryweather Machy. Co.	307
Mueller Machine Tool Co.	147
Munson, E. G.	336
Murchey Mach. & Tool Co.	102
Murray Mylrea Machine Co.	206

National Acme Co.	44, 45
National Automatic Tool Co.	34
National Lead Co.	199
National Machine Tool Co.	168
National Machine & Tool Co.	258
National Machinery Co.	292
National Tool Co., The	148
National Twist Drill & Tool Co.	280
Nazel Engineering & Mach. Works	279
Neil & Smith Electric Tool Co.	174
Nelson-Blanck Mfg. Co.	242
Nestor Mfg. Co., Inc.	270
Newark Gear Cutting Machine Co.	257
New Britain Machine Co.	25, 259
New Britain Tool & Mfg. Co.	266
New Departure Mfg. Co.	37
New England Drawn Steel Co.	196
New Jersey Machinery Exchange	297
Newton Machine Tool Works, Inc.	18, 19
New York Leather Belting Co.	219
New York Machinery Exchange	300, 301
Niagara Machine & Tool Works	279
Nicholson File Co.	349
Nicholson & Co., W. H.	286
Niles-Bement-Pond Co.	2nd Cover, 306
Noble & Westbrook Mfg. Co.	174
Norma Co. of America	223
Northern Engineering Works	222
Norton Co.	118, 119
Nuttall Co., R. D.	254

Oakley Chemical Co.	273
Oakley Machine Tool Co., The	207
Oesterlein Machine Co.	70
Ohio Machine Tool Co.	30
Oil & Waste Saving Machine Co.	274
Oliver Instrument Co.	163
Oliver Mfg. Co., W. W.	242

(Continued on page 354)